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An annual announcement

of greater importance this year

IN January **AMERICAN MACHINIST** will publish the 25th annual Buyers Reference Number. As old readers know, this issue is probably the most complete catalog of new equipment, tools, materials and parts published for the metal-working field.

It tells "Where-to-Buy" the hundred and one products metal-working plants require. It reviews all the new equipment announced during the year.

The new Buyers Reference Number is now in preparation. It will be published as the January 26 issue.

Watch for your copy. Keep it aside for a reference book during 1938. You will find it a mighty valuable directory that will answer many equipment questions during the coming year.

This new issue will be more complete than ever.

AMERICAN MACHINIST

EDITORIAL

Tax Action

THE FOREGOING message from the president of the McGraw-Hill Publishing Company states the general case for tax relief that business and industry may resume the road to recovery. Following this editorial is an article in which the ruinous effects of the undistributed profits and capital gains taxes on an average business are described in detail. For obvious reasons the identity of the company is not disclosed.

You are urged to read both Mr. McGraw's message and the article, and then to make use of the post cards on the opposite page. Why? Because unless Congress can be persuaded to act, and act promptly, the chances for immediate or even eventual recovery are remote. The administration has not the power —yet—to stimulate or stifle business without legislative authority from Congress. In this case legislative action to lift the tax load is essential. It should apply to 1937 business.

As this is written the first stampede for tax relief is slowing down. We would be the last to urge hasty, unconsidered action on any kind of a tax measure. Exactly that sort of action is what passed the vicious tax laws about which we are now complaining. Nevertheless, means must be taken to keep constantly before your legislators the necessity of remedial action.

A sensible tax measure should be the first order of business for the special session and for the regular session that will follow it. If no other legislation is enacted the Congress will have done more for the country than any Congress has done in recent years. That sounds like a very sweeping statement, but we stand back of it. Many of the laws passed during the last five years are excused because of the existence of an emergency. Some of them have been voided by the courts, most of the rest need amendment or clarification.

JUST NOW there is time to do a workmanlike job on a tax bill. If we don't see that it is done we are more than likely to have another emergency on our hands. This is no time for politics or personalities. We are not prepared to stand the strain of another major depression now. Some individuals and a few of the strongest companies may have reserves that will see them through, but the great majority of us have not recovered from the last catastrophe. The tax laws have seen to that. And that is why you must do what you can to get them changed, and do it at once.

Effect of Federal Taxes on the Capital Goods Industry

THE BEST WAY to investigate the effect of taxes is to examine their practical effects on existing conditions rather than to trust entirely to imagined results from brilliantly conceived inventions in the field of government finances. To assist in making such a practical study, we are glad to present herewith the financial history of a business in the metal trades industry for the past twelve years. It is safe to say that there is nothing peculiar about the experience displayed, but, on the contrary, it shows up in measurable form results of our tax policies that apply in greater or less degree to all strongly cyclical industries.

In Chart I are shown diagrams giving the sales, the number of workmen, and the surplus of the company for the years 1926 to 1937, inclusive. The surplus is defined as the excess of net worth above capital stock outstanding. The capitalization did not change during the period illustrated.

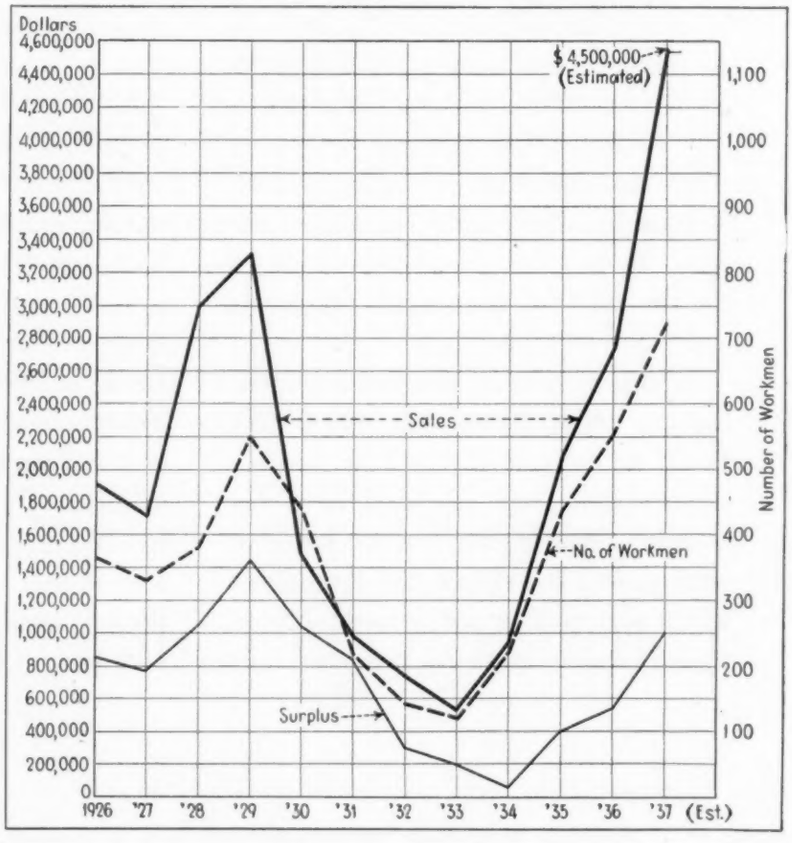
Variation in sales

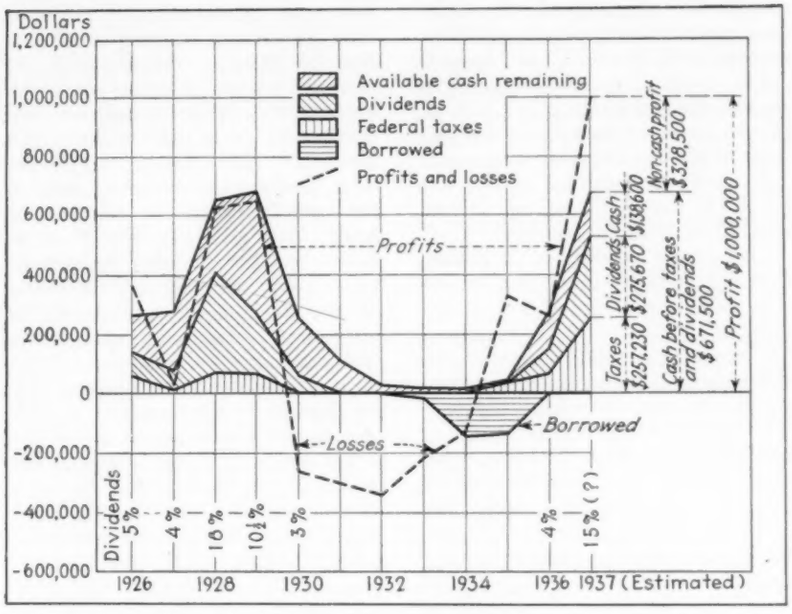
The first noticeable feature in this company's history is the great variation in sales, ranging from more than $3,300,000 in 1929 to a low of $492,000 in 1933, with an estimated total of $4,500,000 for the current year. It should be noted that all figures for the current year are estimated as of December 31, but conditions are such that these estimates can be expected to be a close approximation.

The number of workmen employed varies also with the sales. It does not go down so rapidly, nor does it rise so high. There are a number of reasons for this. One of them, of course, being that shorter hours are worked at the bottom of the depression than at the peak of activity. Another and important reason is that a large proportion of the workmen were employed on development work during the bottom of the depression so that their numbers were greater than would be required to produce the volume of goods actually sold. This development work is undertaken at this period in the business cycle as a matter of deliberate and established policy with this company. It enables the best men to be kept employed at a lower expense for materials than would be the case if they were engaged in building up inventory. At the same time, it leaves the company in the best possible competitive condition when business returns. The success of this policy is evidenced by the high sales for 1937 as compared with 1929 which is a greater improvement than is shown by a comparison with productive industry in general for the two periods.

Actual figures from a well-known company show beyond question of a doubt the confiscatory character of the Undistributed Profits Tax. For obvious reasons the company cannot be identified here. The editors are happy to accept responsibility for the authenticity of this article

I—Top picture of the business experience of a machinery company—1926-1937—showing sales, surplus and employment records





II—Profits and losses varied widely for this machinery company during the 12-year period, but the total net profit is small

Perhaps the most significant information in the diagram is the change in surplus. In 1929 this surplus stood at $1,445,000. It was drawn down in 1934 to $60,000. In other words, $1,380,000 of reserves in that period was poured into the task of keeping the company alive and healthy as a going concern under conditions of very poor business and very small income. It is noticeable and characteristic that the surplus continued to be drained during the year 1934, even though business had started materially to pick up. The heavy drain on surplus for that year was due to the necessity for working capital to finance expanded operations.

Working capital

Working capital is, of course, money which has to be employed in a business more or less roughly in accordance with its scale of operations. It goes into providing the necessary supply of raw materials, work in process, inventory of finished goods, and goods sold to customers but not yet paid for. Operations cannot be expanded without finding the money somewhere for the necessary increase of working capital, and if operations cannot be expanded, neither can employment. The expansion of employment depends on the ability of a firm to expand its working capital when increased business becomes possible.

The depletion in reserves is in part accounted for by charging off depreciation on machinery, buildings and equipment, to keep up the company's assets not merely in book value but in working conditon. This depreciation should be made good by the purchase of new equipment, machinery, etc., as the depreciation occurs. Under the conditions of the cyclical industry, these depression reserves do not remain available as cash, but have to be spent for carrying the company through hard times. These sums then have to be made good by expenditures from what should be cash profits during good times. This is one of the factors which reduce the amount of cash available to lay aside. It would help if a certain percentage of expenditures for equipment, machinery, etc., were made tax free to permit this necessary cash expenditure.

Chart II shows further details of this 12-year period. The dotted line shows the profits which will be seen to bear some relationship to the sales as shown in Chart I, but to vary much more violently. The first peak of profits was in 1929 when they amounted to $650,000. Profits of $1,000,000 are estimated for the current year.

Losses are also shown by the fact that the profit line dips below the zero line. These losses were greatest in the year 1932 when they amounted to $324,000. It will be seen that the excess of profits over losses is not large, and, in fact, when dividend payments from the combination of profits and losses are considered, the twelve years yielded an average of just a little under 5 per cent, which is of course much less than 5 per cent on the net worth of the company, since the surplus line in Chart I indicates that at all times the net worth was greater than the capitalization. The earnings available to stockholders will, therefore, be seen to be meagre for the whole period in spite of the fact that it includes two high spots and only one depression.

It is profits, of course, that are taxed, and not available cash. It is important, therefore, to analyze the form in which the profits occur. This is done in the chart on the basis of the expected condition for the end of the current year, the principal significance of this being that it shows a year of almost unprecedented profits in which presumably the tax-paying ability of the company would be at its highest.

On December 31, 1937, it is estimated that of the $1,000,000 profit, $671,500 will be, or will have been, in the form of available cash before the payment of taxes and dividends; while the non-cash profit is $328,500. This non-cash profit is in the form of additional working capital whose elements have been described as being necessary to the expansion of operations and the expansion of employment.

Cash or dividends

The important question which the management has to face relates to the division of the cash between dividends to stockholders, taxes to the government, and cash reserve for carrying the company through the next period of hard times. A possible solution is indicated. If the dividends are set at 15 per cent (which is not quite sufficient to make an average of 5 per cent for the period) then the sum assignable to dividends will be $275,670, and the amount which will have to be paid the government in excess profit tax, normal income tax, and undistributed profits tax, will be $257,230. This leaves a balance to put into cash reserves of $138,600. If more dividends were paid, taxes would be somewhat less, but the total cash would be decreased also. If less dividends were paid, taxes would increase and the amount of cash available would somewhat increase, but the total of dividends and cash would be less, so that the already small average earnings of the company would diminish. In any event, such a solution would be against the purpose of the undistributed profits tax, which is to force earnings out into the hands of stock-

holders where they may be taxed again.

Again it must be remembered that $138,000 cannot be all laid aside as a reserve. In fact in the case under consideration *every cent of it is needed for replacing wornout machinery and the company has no business to save a single cent of it.* As explained, this situation is due to having to spend the depreciation reserve to keep the company alive and a reduced force employed during hard times.

Inadequate reserve

The difficult situation which the company finds itself in, not merely for the present but for the future, is revealed in the comparison of the years 1929 and 1937. Following the high volume of business in 1929, the company was enabled to go into the depression with $411,000 of available cash, after taxes and dividends had been paid. With the much higher volume of business and of profits of 1937 the solution shown here will permit of only $139,000 of available cash for cushioning a depression. The $411,000 in 1929 was not enough. As indicated in Chart II, it was necessary to borrow money from the bank during the years 1933, 1934, and 1935. The year-end peak was reached in 1934 when the company had $140,000 of notes payable outstanding. While this was the highest year-end condition, as a matter of fact, the peak of the borrowings occurred during the year 1935, when they reached $240,000.

It is evident from these considerations that the cash resulting from this year's operations on the distribution shown will be insufficient to cushion the company and its workmen against a new depression. Operations will have to be stopped much sooner, less attention can be paid to the personal circumstances of the workmen in laying men off and in general a hard-hearted short-range and really short-sighted policy will be forced on the company on the next down-swing in business.

One of the alternatives, of course, is to expand the borrowing operations which were entered into in the years 1933, 1934, and 1935. Attention should be called, however, to the nature of these borrowing operations. They are not of the type that is considered good banking, either by conservative bankers on the basis of their own experience, or by the rules in force at the present time under the Federal Reserve Act and the Federal Deposit Insurance Corporation. They are long-time capital loans required for the replenishing of working capital. They are not short-term loans to finance current production and distribution. It is bad banking practice which is necessary to meet this condition. It was only justified in the case shown on account of the comparatively small size of the loan and the demonstrated improved operating conditions of the company. Without the necessary cash reserves, that loan would have to be so much bigger, and with the new tax conditions so much more difficult to pay off, that the banks would not be justified in again making loans for replenishing working capital on the next upswing.

The generally accepted solution to this dilemma is that of conserving the cash by issuing the major part of the dividends in the form of a taxable paper instrument of some sort. This may, under different conditons, take the form of common stock, or preferred stock, or notes of some form that will be taxable to the stockholder as a part of his 1937 dividend. These various expedients have been widely discussed, one of the best treatments of the subject being that given in the Dun & Bradstreet Review for September, 1937. This solution will be tough on the stockholders, particularly in companies of the owner-management type in which the majority of the ownership is held in comparatively few hands. In that case, the balance of financial interest of the individual in his equity as owner as against his income as stockholder may lead to a solution which still leaves the business short of cash on the most careful and conservative balance of interests. The situation for the manager-owner may even be one in which the desirable solution from the company's standpoint involves so large a proportion of the payment of dividends in paper that he will be unable to get cash with which to pay his income taxes. This is no imagined possibility. It is an actual dilemma facing many companies and individuals.

An unethical alternative

Of course, the large owners who are also officers can meet this situation by raising salaries to a sufficiently high point; but it is not proper to do this to the prejudice of the interests of minor stockholders.

In any event, the solution by the issuance of taxable paper dividends in some form is a solution which cannot be continued indefinitely. Unless this tax situation is to be changed

Table of operating figures from which the charts were drawn

YEAR	CHART I			CHART II						
	NO. OF WORKMEN	SALES IN M's	SURPLUS IN M's	PROFITS & LOSSES IN M's	DIVIDENDS IN M's	RATE	FEDERAL TAXES IN M's	CASH BEFORE DIVIDENDS & TAXES	AVAILABLE CASH	BORROWED
1926	364	1933	854	362	92	5%	43	275	140	
1927	329	1725	793	13	73	4	2	282	205	
1928	381	2961	1047	627	331	18	75	644	238	
1929	553	3326	1445	650	193	10½	72	676	411	
1930	437	1510	1136	-254	55	3	0	285	230	
1931	218	984	848	-287	0	0	0	107	107	
1932	144	743	312	-324	0	0	0	30	30	
1933	120	492	193	-218	0	0	0	20	20	10
1934	232	892	60	-132	0	0	0	20	20	140
1935	436	2087	392	328	0	0	45	51	6	130
1936	552	2738	543	288	73	4	73	292	146	
1937 ESTIMATED	725	4500	1000	1000	276	15	257	672	139	
						Av. 5%-				

to something more sensible, the new paper issued as a substitute for cash dividends on each rise will accumulate with each cycle and constitute a continued watering of the stock, building up eventually a capital structure which is out of all relation to the net worth of the company. As will be seen from Chart II, the particular company in question has no business issuing further securities. Its surplus approached the zero point in the years from 1932 to 1935, and unless its net worth under depression conditions is increased thereby, no further obligations should be issued. This solution by the issuance of new securities is, therefore, one which is justified only if this is the last time it ever has to be done. In other words, it looks forward to a repeal of the excessive taxes at present in force.

Dangerous or impossible

Not only is the issuance of new securities dangerous if repeated, but it is in many cases impossible. Suggestions have been made to take care of the difficulties the small company has in the issuance of new securities, and exemption of profits below $5,000 or $50,000 has been suggested. These limits are far too small to meet the situation. From the standpoint of the undistributed profits tax, a small company is one which does not have ready access to the public security markets for the replenishing of its cash paid out in taxes and forced dividends. It is difficult indeed to float a public issue much smaller than $500,000. The mechanism for the floating of smaller sums does not exist. This means, roughly that a company whose net worth is less than $3,000,000 to $5,000,000 is a small company from the standpoint of the undistributed profits tax. There is more to it than this. Conditions may be such that even the largest companies would be unable to float securities to meet conditions brought about by this tax. This would be the case if the tax year ends in a period of depressed markets when new financing has become impossible.

Cycle Industries

If the undistributed profits tax is to remain, and if the normal tax is to remain at its present high rate, it will be necessary to take cognizance of the wide variations of the cyclical industries so that they may not be taxed on the replenishment of depleted working capital. It has been suggested to ease this situation that two or even three years' profits and losses be averaged up to determine the tax basis. As will be seen from this diagram of a typical cyclical industry, five years equalization is not too long a period to use as a basis for assessing taxes, so that companies of this sort can make a recovery from depression conditions.

Let us turn now to a resumé of the points already made and of other general considerations as yet not touched on.

RECOMMENDATIONS

1. Special provisions must be made for small companies if the undistributed profits tax is to be retained, facing the fact that a small company is one with a net worth up to $5,000,000, whose requirements are too small to be met by public financing.

2. It may be impossible for a company of any size, whose profits are large, to do the necessary public financing under normal conditions which may obtain at the year's end.

3. Expenditures to make up depreciation losses in equipment are necessarily delayed until good times. The unspent depreciation reserve is not really profit. Some provision, such as leaving expenditures for replacement tax free, should be made which will recognize this and permit the necessary expenditures.

4. In a cyclical industry provision for five years' equalization of profit and loss should be provided as the basis for taxation. Otherwise, the average profits of such a company will be very much more heavily taxed than will the average profits of a non-cyclical industry.

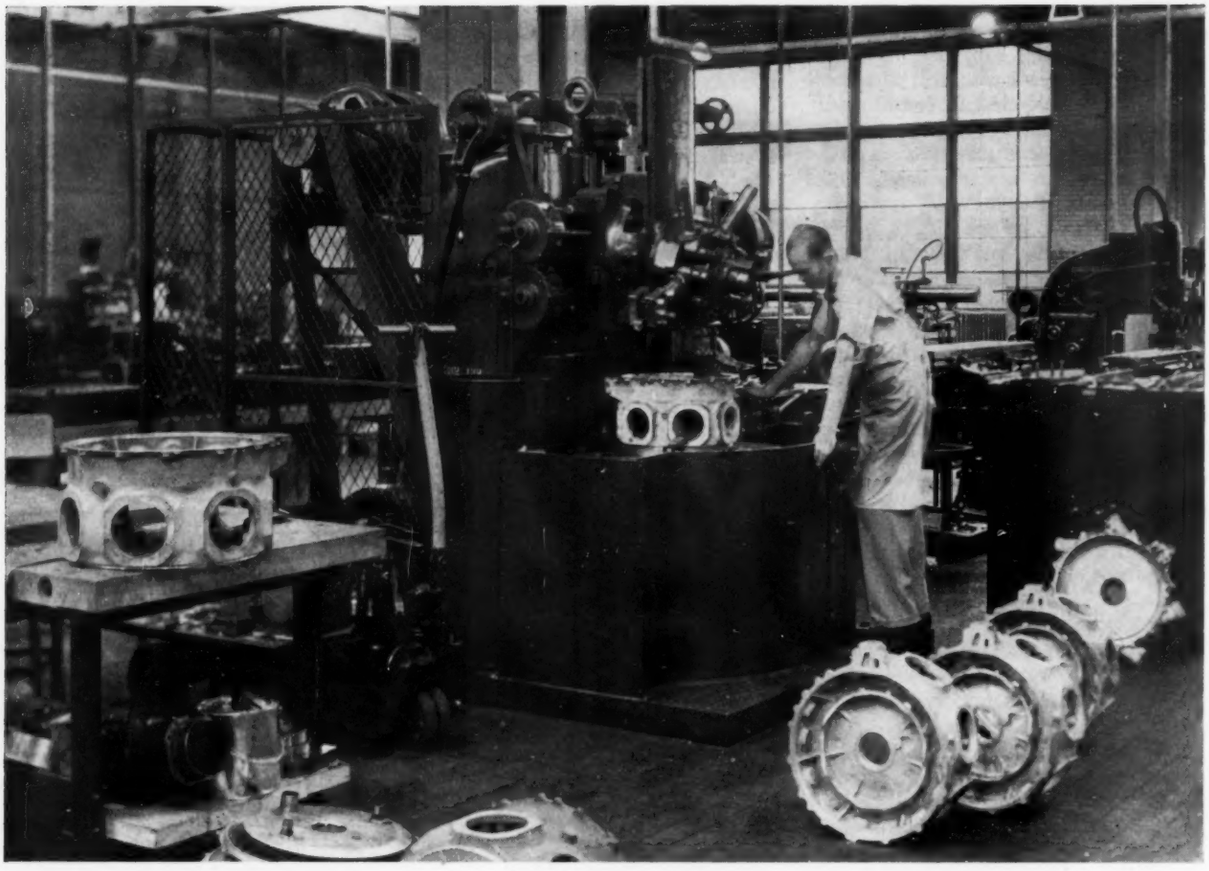
5. Unless the tax laws are drastically altered, the solution by the issuance of dividends in some form of paper for successive periods of prosperity will result in accumulative additions to the capital structure unwarranted by the real value. This constitutes a condition of flagrant stock watering. If the depreciation reserve is spent and taxes consume the cash needed for replacement, the increased capital structure will be applied to any net worth which is actually decreasing.

6. Some balance should be sought as between the endeavor to plug up "loop-holes" on the one hand and tax policies which, on the other, result in the repression of business and of employment. As a practical matter, it may turn out that it is better to leave some tax leaks than to close them up to the detriment of business and of employment.

7. While the diagrams shown relate to a business which has passed the youthful stage, it should not be forgotten that such an exhibit as that shown on the upturn from 1933 to 1937 would require such a heavy payment in taxes that the old-fashioned American method of business growth would be impossible. There are few successful businesses of any sort in the country which have not grown by putting their profits back into the business during the youthful stage and until they became of such size as to make public financing possible. Though not exhibited in the case of the company illustrated, this is one of the most serious faults of the present tax system.

8. These considerations raise the whole question as to the proper place for application of the income tax. They raise grave doubt as to the wisdom of applying it on business operations. To apply it thus hampers hard-time operations and employment, the purchase of equipment, the health of the capital goods industries, and the normal means of expansion of industry and of the corresponding employment. The crux of the situation lies, of course, in the fact that much corporate income is of necessity of the non-cash type, and much more of it is by virtue of business wisdom permitted to accumulate in non-cash form. This is to the advantage of business activity and employment. When income has once left the business mechanism and come into the hands of private persons it can be taxed much more safely than while still it remains in corporate assets. Such considerations look toward a reversal of the undistributed profits tax principle, a reduction of the normal business income tax, and an increase in personal taxes, particularly in the area where the greatest returns are to be found. From all available information, this would appear to require a restricted increase in the upper brackets (now nearly confiscatory), a larger increase in the middle range of incomes, and an extension of the tax well down into the lower range of incomes.

Any loop-hole expedients that are applied should be carefully devised with reference to the question as to whether or not they hinder the expansion of business activity and employment, and the generation of taxable profits.



Work on crankcase castings begins here; all material moving in this shop is done with hand trucks shown at left of lathe

Navy-Built Airplane Engines

A new plant in Philadelphia gives the government three things: 25 engines per week if needed, a shop for experimental engine construction, and another "yardstick" for the measurement of costs

R. R. WIESE
Assistant Editor, American Machinist

IN 1934 THE Vinson-Trammel Act was passed. It required that the Navy build ten per cent of its engines and airplanes. The Naval Aircraft Factory, Navy Yard, Philadelphia, was already available for the construction of airplanes, but the Navy had no provision for the construction of engines. After PWA funds were allotted, a completely new engine plant was engineered and constructed as part of the Naval Aircraft Factory.

In two years time the new building was completed, machinery was purchased and installed. The first engine was completed and passed its tests successfully in April of this year. One hundred engines now under construction are similar to the Wright R-760, a seven-cylinder radial.

At the present time the shop schedule calls for only three engines per week. Actually the plant has been so engineered and arranged that, in time of emergency, production can be stepped up to as many as 25 en-

gines per week with little additional outlay for machinery and none for buildings. While this may give the plant an appearance of being overmachined, purchases of machinery actually were limited and planned so carefully that there is no duplication of special machines and the number of standard models is kept down to a minimum.

To keep employment at a constant level during normal times it is necessary that each mechanic be able to handle several machines. It is impossible for him to specialize and continue on the operation of one machine day in and day out. Therefore, in the purchase of all machinery the "average man" ability had to be taken into account and specifications were rigidly written on this basis. Each machine was purchased with an eye to securing good efficiency with accurate dimensions when operated by someone not necessarily expert on that type of machine.

The shop is departmentalized according to engine parts and according to material used. One side of the shop is devoted to operations on nonferrous materials and the other half of the shop to the operations on ferrous metals. These divisions were further departmentalized according to work to be done. In general, efforts are made to complete each part of the engine in its own department. For example, the engine cylinder barrels are rough turned, finish turned, fins on the barrel are rough turned and finished turned, and the threads at the bottom of the barrel are ground all in one section of the building.

The grinding department is the only strictly operations department. It is used principally for parts on which grinding is the primary operation. In all other cases, grinding and other work on parts is done in the section devoted to that part.

Cleaning facilities are placed in the several departments for intermediate cleaning operations. Caustic soda and warm water are used.

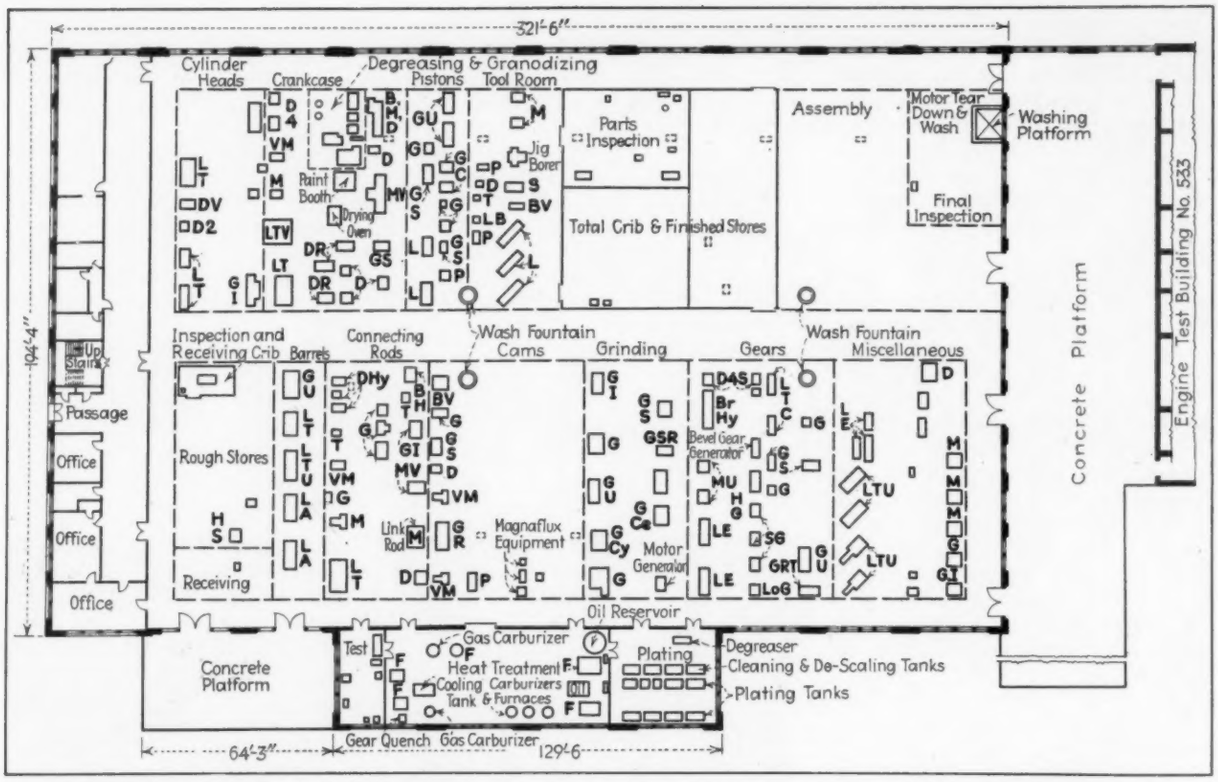
An interesting feature is that the toolroom is not separated from the rest of the shop by walls of fences. This has the double advantage of avoiding obstructions on the floor and of permitting use of the tool room machines in regular production in case of emergency.

In fact, so insistent was the management on the question of avoidance of obstructions that the only break in the entire floor plan is the fenced-in tool stores, inspection room and the finished-parts room. Even this furnishes a logical separation between departments.

The plant has its own plating, heat-treating and testing departments. The heat-treating room is equipped with several types of carburizers and

First operations on valve cams are done in this turret lathe; final shaping is done on milling machine with profile attachment

A view of the toolroom shows the degreaser, paint booth and drying oven in the background. The exhaust collector on the grinder (left center) is the type used on all other machines where dust is created



The layout of Naval Aircraft Factory engine shop is designed for easy flow of work from the receiving floor to final assembly. Machine types are designated by letters: B—boring machine; Br—broaching machine; D—drill (number of spindles is also indicated); G—grinder; H—hobber; L—lathe; La-lapping machine; M—milling machine; P—press; S—shaper; Sh—hack saw. Specifications include: A—automatic; C—cutter; Ce—center; Cl—centerless; G—gear; H—horizontal; Hy—hydraulic; I—internal; R—radial; Rt—rotary table; S—surface; T—turret; U—universal; V—vertical.

heat-treat furnaces. The heat-treat furnaces are all electric with gas curtains to prevent oxidation. Oil quench tanks are spotted near the furnaces. A central tank with circulation pump supplies the quenching tanks with cooled oil. Gears are kept from warping after carburization or heat-treating by a gear press which holds the gear in oil.

The test room is next to the heat-treat room. Each heat run is checked immediately. An impact machine, a tensile testing machine, hardness testers, and facilities for micro-photographic work are available.

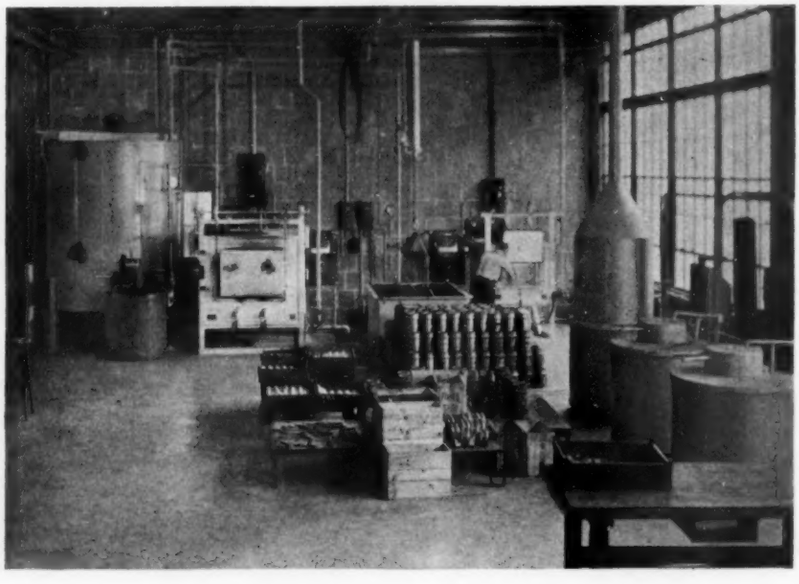
The plating room is the usual industrial type, being equipped with dip tanks for cleaning and for copper, cadmium and nickel plating. A degreasing tank is also used in this room.

It will be noted that in order to avoid complications and confusion in the degreasing processes, two set-ups have been established. One degreaser has been placed in the center of the non-ferrous department for the cleaning of those materials which are not plated. Cleaning tanks and paint spray equipment have been placed adjacent to this degreaser.

Care exercised in the construction of these engines is indicated by the approximate ratio of one inspector for every ten mechanics. One man inspects all material as received. This includes dimension and quality inspection of castings, sheet and bar stock, plates and finished products which enter into final assembly of the engine. Any materials tests required at this stage are requested of the test section by this inspector.

In an airplane engine where mate-

Central oil reservoir in the left corner has circulating pump for supplying all quenching tanks in the heat-treating room. Furnaces have individual recorders and controls



rial is working near ultimate strength in order to allow weight saving, any surface imperfections, scratches or cracks must be avoided and detected to prevent failure due to stress concentrations or to reduced areas. Magnaflux inspection is used on every steel part during the course of its manufacture. The Magnaflux system used here is so sensitive that an inspector of good judgment must be used to prevent an excessive amount of discard.

The remainder of the inspection group is located in the fenced-in inclosure at the center of the building. Dimension and finish checks are made on all parts. One hundred per cent inspection is the requirement here. For example, every gear used in the engine is checked on a Red Liner recorder. No sampling inspection is done.

Status of all work in process is kept on a single large chart hanging in the shop master mechanic's office. Finished parts are kept in the central stores until needed in final assembly. The final assembly section lies between the finished stores and the torque stands. After completion of the test run, engines are dismantled, cleaned, inspected and reassembled and prepared for shipment. The loading platform is between the final assembly section and the test stands.

In the N.A.F. engine manufacturing shop, the government has a modern plant available for emergency engine manufacture. At the same time it can be kept in operation with a minimum expenditure of money, providing employment all along the line, schooling for engineers and a yardstick by which to compare costs of government contractors. Experiments which others could not or would not make can be made in this shop with the possibility of developments for the far distant future.

Planetary Geared-Head Lathe

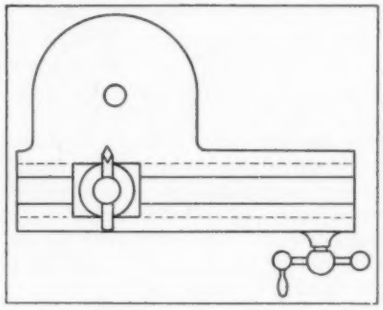
FRANK C. HUDSON

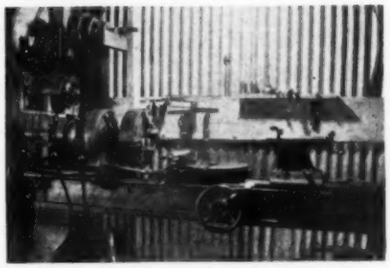
In the little shop of Bill Dilldine who is a graduate of the Franklin Motor Company and who now specializes in rebuilding wrecked automobiles, in Orlando, Fla., I found a machine that bears the designation of Engine, Turret and Milling Machine on a triangular name plate, with the name of Samuel K. Landis, Lancaster, Pa. as the maker. As nearly as I could learn it was a "war baby," bought new soon after 1919 and cost $1600. It is No. 21 and has every appearance of being very much older as it differs in many ways from the usual lathe.

In addition to the stepped pulley the headstock contains planetary gearing both for back-gearing and reverse, this being controlled by the two levers in front, as with the old pedals of the Model T. The carriage saddle has a sort of flat turret that has a T-slot for tools, beside the tool block and slide along one side as shown.

For turning between centers the tool block is fed along this slide by a screw inside, driven through universal joints, from a small shaft outside the head stock. This shaft is driven from a splined feed shaft, the small geared head of the short shaft drive being moved along the splined shaft at will. The tool block is moved by hand from the ball handle at the right of the slide, through bevel gears. For turning tapers the slide is swung to the desired angle by moving the whole top of the carriage.

Saddle has a T-slot for tools





There is no leadscrew on this "war baby"

Thread cutting is done without a leadscrew. Instead the long shaft in front of the bed has a worm on the end which drives a worm wheel behind the large handwheel shown. This worm wheel, when clutched in with the handwheel, drives a pinion that meshes with a rack under the carriage, between the ways.

When used for milling, an end mill is carried in the lathe chuck or in the taper of the spindle, or a slab mill is carried between centers. A vise or angle plate, bolted to the flat turret part of the carriage holds the work. Or the carriage top can be swung with the slide at the right angles to the bed and index centers used for fluting taps or similar work. With the slide in this position either the face plate, or large work, can be faced by feeding the tool across it.

Benches Both Ways

Controversy as to bench location frequently waxes hot and heavy between advocates of the wall or right-angle location. Both sides give reasons that are conclusive—to them at least—as to the advantages of their particular favorite. One shop at least has taken the bull by the horns and uses both types together, as can be seen.

Each man has a bench facing the window as well as a right angle bench so that he can take his choice. This gives him the advantage of a separate work space which the right-angle bench advocates claim, and also the opportunity of working with either a front or a side light.

This arrangement still provides room for argument as to whether the right-angle bench should be at the man's left, as in this case, or at the right. Presumably the location shown has been found best for these men and this class of work, as the arrangement might just as easily have been the other way. Then too, there is always the question of the left-handed mechanic. The scrap baskets at the end of each bench give an incentive to keep the shop and benches clean and orderly.

Better Tools from Better Steels

Tool steel selection, tool designs and heat-treatment methods are analyzed on the basis of final results by Westinghouse at East Pittsburgh

BEN C. BROSHEER
Assistant Editor, American Machinist

TOOL QUALITY, always a highly variable factor, can be improved by (1) changing the design, (2) spending the extra time required to make a good tool from the wrong steel, or (3) selecting and properly heat-treating a more suitable material. Less expense is usually incurred by increasing the quality of the tool steel than by adding to the work required of the toolmaker.

Tool cost, except in the case of certain simple cutting tools, is largely labor cost; the relative cost of the material is small. An increase of five to twenty per cent in the cost of material used will usually have but little relative effect on the final tool cost. Increased useful life obtained from a tool almost always justifies the added material cost.

Investigation

More than twenty years ago, recognizing the need for more accurate tool steel application data than was then available, the management of the Westinghouse Electric & Manufacturing Company formed a tool steel committee at its East Pittsburgh Works. This committee was charged with a complete investigation of all types and grades of tool steels; the ultimate purpose then was to develop standards for stocking and applying these materials.

This committee, having now a wider function than was originally conceived, is at the present time operating to: (1) determine the best types of steel for given applications; (2) develop standard purchase specifications for each tool steel used; (3) develop with the suppliers special tool steels when those regularly available do not perform satisfactorily in a given application; (4) develop heat-treating specifications for each type of tool part and each type of steel; and (5) assist in the development of tool designs that use available steels to best advantage.

Regular members of the present committee include the director of time study and methods, the general purchasing agent, a staff supervisor of the tool making department, two metallurgical engineers, a research metallurgist, a tool engineer and the purchasing engineer. Meetings of the committee are regularly scheduled once every six weeks, but special meetings can be and are called by the chairman when immediate action is required on an urgent matter.

All Westinghouse plants are invited to send representatives to regular meetings. Also, tool room supervisors, tool and material inspectors, production department tool supervisors and tool designers located at East Pittsburgh are frequently asked to assist in developing solutions for mutual problems. Their experience in the actual application of various steels is often required to develop correct solutions.

Standard Practice

Reports of all meetings are duplicated and copies are sent to more than 80 interested men in the various Westinghouse plants. Findings of the committee are made standard practice at East Pittsburgh; other plants accept them as standards if they are found suitable for local requirements. The committee also acts as a clearing-house for all tool-steel data. Results of tests in other plants are reported to the committee and summaries are broadcast to all plants.

Typical of the current investigations being carried on by the committee are the following:

1. Preparation of a standard for inspection of tool steels. This includes an evaluation of the importance of steel quality.
2. Test of punches and dies for blanking electrical sheet steel. This investigation is intended to obtain data on the best steels and tool designs for this purpose. It also includes a study of the relative lubrication value of different coatings.
3. Cutting test of forged and tipped tools to determine efficiency of various steel types and to compare this efficiency with the cost of tools and steels.
4. Evaluation of liquid carburizers.

Fourteen grades have been established by the committee for tool steels used in the various Westinghouse plants. All of these steels are purchased according to established standard purchase specifications. These specifications have no reference to brand names, but list allowable limits of constituent materials. Requisition for tool steels are written to include the purchase specification number of the material wanted. Specification of tool steels by specification number rather than trade name has been found to eliminate much of the confusion that was formerly experienced when working by trade name alone. The following is an example in general of a tool steel purchasing specification:

DETERMINATION OF DIE STEELS BY ACTIVITY AND MATERIAL TO BE PUNCHED		
NO. OF PUNCHINGS	MATERIALS PUNCHED	STEEL NUMBER
Under 5,000 Under 50,000 (Low Activity)	All metals and all thicknesses. Soft ferrous materials up to 0.046 inclusive. Non-ferrous materials of all thicknesses. Note:-Use No.3 T.S. for dies that can be ground and the sizes come within the stock sizes carried.	(See note) NO.7 T. S.
Under 50,000 Over 50,000	Soft ferrous materials over 0.046, hard or scaly ferrous matls. (All thicknesses), non-ferrous matl. over ⅛". Soft non-scaly ferrous materials under 0.046 thick and non-ferrous materials of all thicknesses.	NO.15 T. S.
Over 50,000	All scaly, hard or tempered ferrous materials, silicon steels and cold drop forgings, also soft non-scaly ferrous materials over 0.046 thick.	NO.2 T. S.
All Quantities	Trimming dies for hot drop forgings. H. T. 11-5 and H. T. 213.	NO.11 T. S.
All Quantities	Heavy Fuller-board, fibre, fish paper and mica. See H. T. 202-203.	H. R. S.

EXAMPLES OF APPLICATION OF HEAT TREATING SPECIFICATIONS

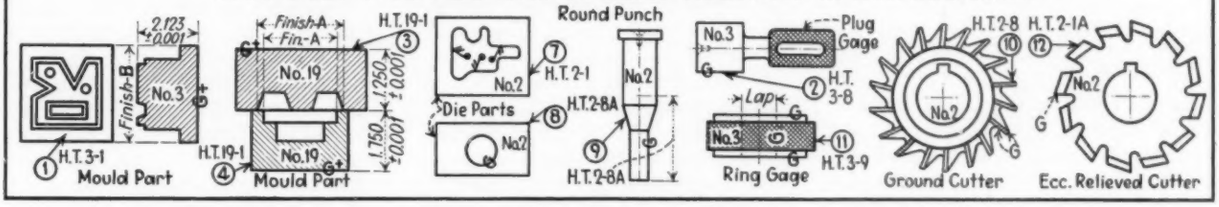


Fig. 1—Application recommendations for standard tool steels include data regarding the type and shape of tools as well as limiting production quantities expected from the tool during its active life

Purchasing Specification for Oil Hardening Tool Steel

1. This specification covers a low tungsten-chrome-vanadium steel suitable for certain low activity dies for piercing and blanking.
2. The steel shall correspond in quality and characteristics to samples submitted under this specification and approved by the purchaser.
3. No change shall be made in the quality of successive shipments of material furnished under this specification without first obtaining the approval of the purchaser.
4. Process: The steel shall be made by the crucible, electric furnace or other approved process.
5. Annealing: The steel shall be properly annealed to put it in the best condition for machining and subsequent heat-treatment.
6. Chemical Composition: The steel shall conform to whatever chemical composition is specified.
7. Check Analysis: Analysis may be made by the purchaser from finished material representing each lot, which shall conform to the requirements under Section 6.
8. Samples: Samples for analysis shall be taken by machining off the entire cross-section of the bar, or by drilling, parallel to the axis of the bar or forging, at any point midway between the center and surface with a drill not under 0.5 in. nor over 0.75 in. in diameter. Samples shall be clean, free from oil, uniformly fine and well mixed.
9. Permissible Variations: The bars shall vary from the specified dimensions by not more than the following amounts:

Permissible Variations

Diameter or Distance Between Parallel Faces — Inches	*Permissible Variations* Plus	Minus
0.5 and under.....	0.010 in.	0.010 in.
Over 0.5 to 1.0 inc..	0.015 in.	0.015 in.
Over 1.0 to 1.5 inc..	0.031 in.	0.031 in.
Over 1.5 to 2.0 inc..	0.046 in.	0.031 in.
Over 2.0 to 4.0 inc..	0.125 in.	0.031 in.
Over 4.0 to 6.0 inc..	0.156 in.	0.031 in.
Over 6.0 to 8.0 inc..	0.188 in.	0.063 in.
Over 8.0	0.250 in.	0.063 in.

10. Workmanship and Finish: The steel shall be free from pipe flaws, seams and other injurious imperfections. It shall have a smooth finish and shall be straight and true to section.
11. Packing: The bars shall be securely tied in bundles so that material will not be bent in handling. A bundle shall contain not more than one size of bar, but small bundles may be tied together.
12. Marking of Bundles: Each bundle shall be plainly and permanently marked with the requisition number.
13. Marking of Pieces: Each bar or forged piece shall have the identification mark, consisting of the figure "7" and a letter indicating the manufacturer, plainly stamped at each end of the bar. For example: 7-E (Where "E" is the letter assigned to the supplier).
14. Bars and pieces which are not bundled shall have the requisition number plainly stamped at one end of the bar or piece in addition to the identification mark which is stamped at both ends of the bars.
15. Inspection: (a) Tests and inspection shall be made at the place of manufacture, prior to shipment. The manufacturer shall afford our inspector all reasonable facilities to satisfy himself that the material furnished is in accordance with this specification.
    (b) Material accepted by our inspector at the place of manufacture which subsequently develops imperfections not detected at the place of manufacture, or which subsequent tests or analyses show not to be in accordance with this specification is subject to rejection.
16. Rejection: The purchaser reserves the right to reject any portion or all of the material which does not conform to the above specification in every particular and to return the rejected material to the manufacturer or seller for full credit at price charged f.o.b. point of delivery specified by the purchaser. If the material is to be replaced a new order will be entered at prices, terms and conditions acceptable to the purchaser.

In setting up both the purchase specifications and the inspection program, full cooperation has been received from the various tool steel suppliers; mutual problems being settled in committee meetings attended by representatives of the suppliers. It is recognized that chemical analysis of the steel does not cover all of the conditions. The manner in which the tool steel is annealed, the presence to an injurious degree of non-metallic and carbide segregations, and the grain size are important. Another important factor is the manner in which the steel has been worked to size.

When difficulties develop with one or another steel, the metallurgical group determines the cause of this trouble and steps are taken to correct any controllable causes. Likewise such methods of inspection as require technical interpretation are conducted by the metallurgical group at its laboratory. This up-to-date laboratory contains facilities for all of the familiar methods of examination and testing of metals. Laboratory heat treatment and metallographic examination also are used for tracking down shop heat-treatment or manufacturing troubles of such types as may occasionally develop.

Chemical analyses and metallographic examinations are made to check conformance of steels with purchase specifications. Also, the now familiar "spark" test is used, since it gives an effective, convenient and inexpensive check on steel type.

Tool steels are occasionally purchased from foreign suppliers in order to compare them with steels offered in the United States. In several instances, the committee has been able to recommend improvements in tool steels after a thorough analysis of those available on the market for a given application.

Heat-Treating

Careful heat-treatment of tool parts is as essential as proper selection of the steel used. Working in full cooperation with the engineering department and the tool supervisors, the tool steel committee has developed standard heat-treating specifications for the standard tool steels. Reasonably uniform results are obtainable when the proper specification is correctly applied by the heat-treater.

Ordinarily, the standard process specification and the judgment of the heat-treat foreman alone are required in following out the heat-treatment of a tool. However, sometimes it is necessary for the metallurgical group, the tool supervisors and the heat-treat department to collaborate in developing highly specialized heat-treating information. For example, a particular die may be very troublesome due to the close dimensional tolerances that it requires in avoiding a highly difficult grinding operation following heat-treatment. Special consideration would then be given to its heat-treatment and a record made of all special operations applied. Design changes may, of course, also result from the study of such a specific tool.

Shape of openings and combinations of thin and thick sections in tool parts frequently necessitate different treating procedures, even though the parts may be made from the same material. This is well illustrated in the sketches shown in the lower section of Fig. 1.

For instance, parts No. 7 and No. 8 are of approximately the same size and are both made from No. 2 tool steel. The round hole part in No. 8 can be ground for finish after heat-treatment, but the irregularly shaped hole in part No. 7 can only be finished by hand-lapping. Such operations are expensive, therefore the irregular hole is brought almost to size before heat-treating and heat-treating specification No. H.T. 2-1 is used. This treatment will cause less distortion, but is more costly than heat-treatment No. H.T. 2-8A, which is applied to part No. 8.

Fig. 2—Each standard tool steel is listed on a chart sheet which is filed in data books furnished tools supervisors and designers. Possible variations in final results are indicated for each steel

STEEL	HEAT TREAT SPEC. FOR TOOL WORK	MACHINE INFORMATION	HARDNESS BRIN.	HARDNESS ROCK "C"	HARDNESS SCLER.	RESULTS WANTED	APPLICATION
No. 5 T.S. carbon steel (1.1-1.35C)	H.T. 5-1	Finish to size before hardening		Rock, super 90 min. 15 N scale		Case hardened surface with semi-hard core, min. distortion	Small pins for micarta moulds
	H.T. 5-2	" " "		57 60		Reduction of brittleness	Straight punches for brass, copper and insulation materials, (shape impractical to grind)
	H.T 5-3	Grind where shown after hardening		63 66		Very hard, keen cutting edge	Locating buttons, counterbore pilots, gage pins and small drill bushings. Hand reamers
	H.T. 5-4	" " "		57 60		Reduction of brittleness	Straight punches (that can be ground after hardening) for brass, copper and insulation materials
	H.T. 5-5	" " "		50 54		Toughness	Special shafts, roller pins, etc.
	H.T. 5-6	" " "		45 48		Toughness	Small drifts, etc., also semi-hard punches
No. 7 T.S. low tung. chrom-vanadium (1.15-1.25C)	H.T. 7-1 ◢	Rough machine strain relieve, finish to size and harden		60 63		Hardness, wear resistance, min. distortion	Taps not ground in thd., gear hobs, etc., special multiple hole drill plates, screw drill bushings, collets that can not be ground in the hole (Draw shank end to 50-55 scl.) Dies impractical to grind
	H.T. 7-5	Grind where shown after hardening		60 63		Hardness, good cutting edge, normal distortion	Hand reamers and cutting tools that require grinding. Dies that can be ground after hardening. (No. 7 T.S. to be used only when No. 3 T.S. is not available)
	H.T. 7-8	Finish to size after hardening		39 43 max.		Semi-hard, normal distortion	Semi-hard die parts used with H.T. No. 7-1 and 7-5 (used only when No. 3 T.S. is not available)
	H.T. 7-9	Rough machine, normalize, harden, draw, rough grind, season and finish grind		60 63		Hard, wear resisting surface, permanence of size, shape and form	1/4 to 4 inch diam. plug thd. gages with 24 thds. per inch and coarser. Plug and ring spline-shaft gages

Note:- All forgings must be annealed before machining ◢ =Anneal when harder than 220 Brinell

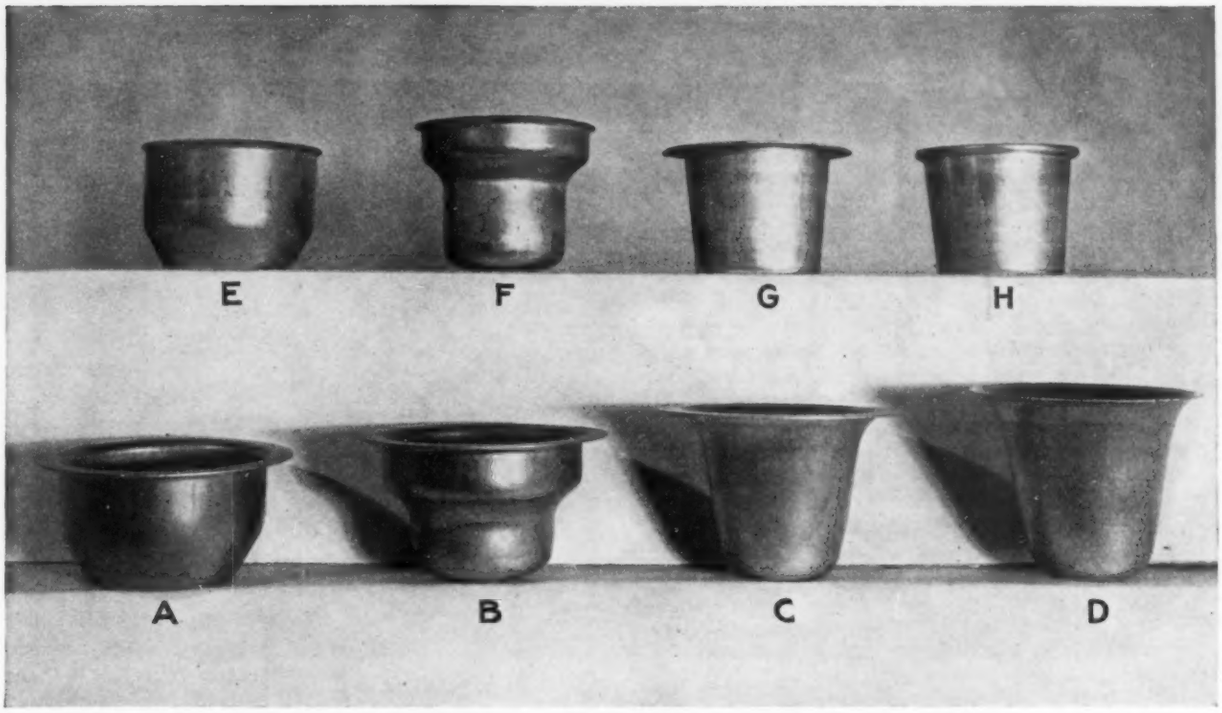


Fig. 1—Steps involved in making a cocktail cup are shown in the lower row, and those for a drinking-cup holder are seen in the upper row

Tapered Shells From Simple Tools

Two similar shells are begun with the same tools, but the tapers involved require different final-operation dies

MARK GOLDEN

MANY DIEMAKERS find that their troubles start when called upon to make dies for shells having tapered sides. In the hollow-ware silver line, so many of the shells are tapered, that a diemaker doing this type of work soon becomes a master at it. Two typical examples from hundreds of such dies that I have made will illustrate the principles involved.

It so happened that I was able to use the same dies for the first two operations on a cocktail cup at *D*, Fig. 1, and for a drinking-cup holder at *H*. Both pieces, shown in detail in Figs. 2 and 3, required the same size blanking and reducing dies.

The first operation on the cocktail cup is shown at *A*, Fig. 1, while the die is illustrated in Fig. 4. Blank size was $4\frac{5}{8}$ in. in diameter, and material was 22-gage deep-drawing copper. In the first operation the shell was drawn to a depth of $1\frac{1}{2}$ in. and a diameter of $2\frac{1}{2}$ in.

The plug over which the metal draws has a reduced diameter, which is a drive fit in the die shoe. A 30-deg. taper on the top of the plug aided the second operation somewhat. The thread for the spring-barrel rod was placed in the bottom of the plug rather than in the cast-iron die shoe, as this construction proves more satisfactory in practice. For clarity, no screws for holding the cutting ring are put on drawings.

Taper shells cannot be produced without preliminary reduction and then stretching the shell to size. The shell from the first operation was therefore reduced as shown at *B*. The depth of such a draw is best determined by trial. In this case it was about one-half the depth of the first operation. For any reduction of this type, sharp corners on the drawing ring and punch must be avoided, for otherwise a circle will be formed on the shell that cannot be removed in subsequent operations. The die used for the second operation is shown in Fig. 5.

In the third operation, *C*, the

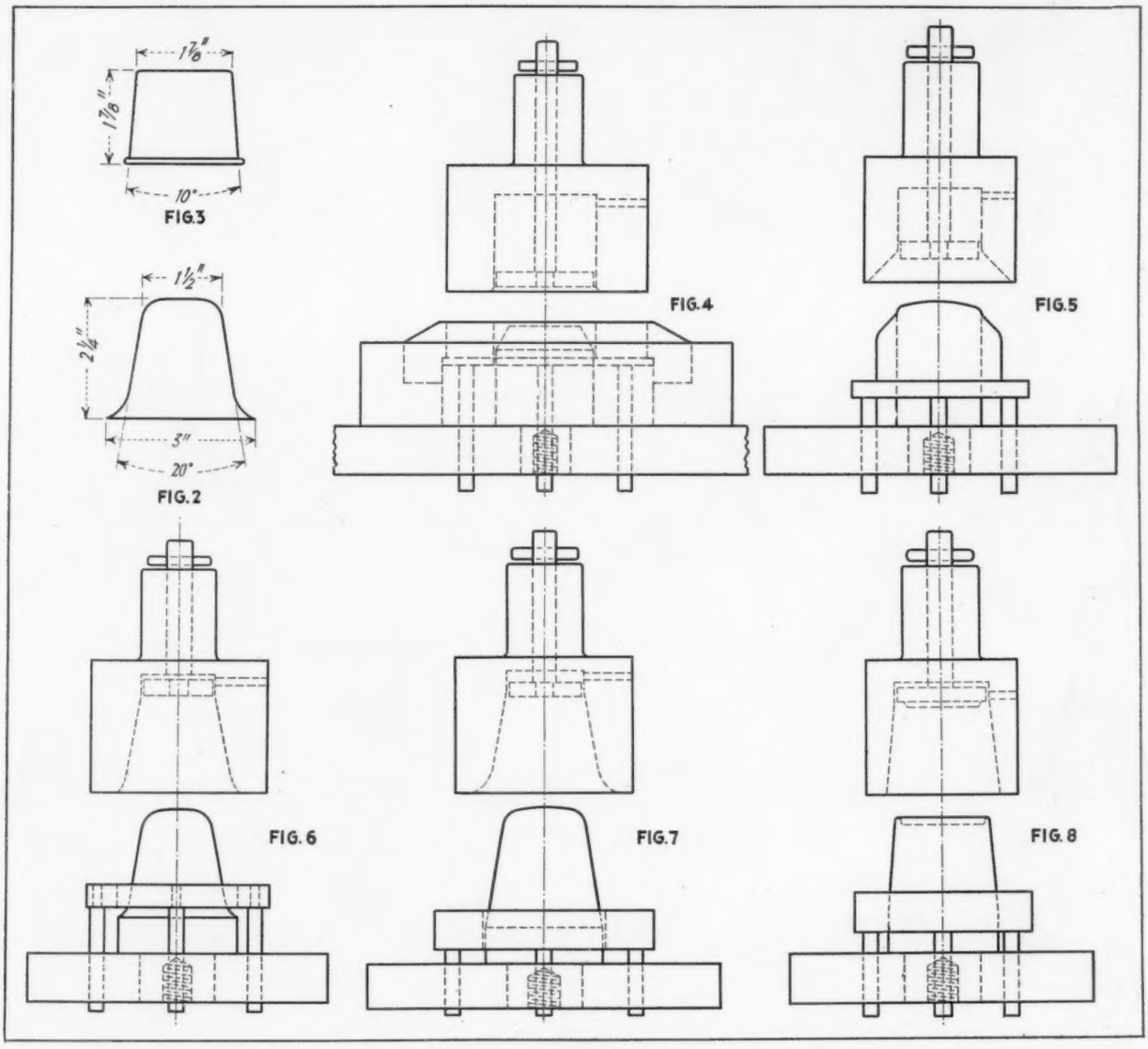


Fig. 2—The cocktail cup. Fig. 3—The drinking-cup holder. Figs. 4 and 5—Both shells are started in these tools. Figs. 6 and 7—Two additional operations were required for the cocktail cup because of the greater taper involved. Fig. 8—Only one additional operation was required to finish the drinking-cup holder because of the easier taper

shell is reduced to a taper form. Because of the angle, 10 deg. on each side, it was not advisable to bring the shell to the finished size and shape in one operation. Another factor was the flare required in this particular shell. The die for this operation, Fig. 6, left the shell approximately $\frac{1}{8}$ in. smaller than the finished shell and the flange was left as in the original draw. This gave the surface with which to hold the shell in the last operation.

Stretching the shell to the final form was done in a die shown at Fig. 7. This final operation gave a smooth clean shell that was trimmed on the edge and was then ready for polishing. Later a stem and base were soldered to the shell to make the completed low-cost cocktail cup.

The second example of tapered work, the paper-drinking-cup holder, was also started in Fig. 4, but was drawn to a depth of $1\frac{3}{4}$ in. The shell is shown at *E*. It next went to the die shown in Fig. 5 where it was drawn somewhat deeper than required for the cocktail cup. The resulting shell is shown at *F*.

The last operation was a stretching and forming one as in the first example. The work was done in the die shown at Fig. 8. The pressure ring was of such a height that it bottomed on the die shoe at the bottom of the stroke, and gave a flat flange that was later trimmed and curled. The shell as it came from this die is shown at *G*.

The smaller angle formed by the sides of this shell enabled the work to be done in one fewer operation. No annealing was required in producing these shells and there was no trouble from broken ones.

Television in Britain

Radio Gramophone Development Company, Ltd., is reported in *Industrial Britain* to be producing combined instruments embodying television and broadcast receiving apparatus together with an automatic gramophone for home use giving the ultimate in home entertainment. This firm is located in Birmingham.

A New Apprentice Speaks

A young man who places no premium on a white-collar job tells why he is learning the machinist's trade

Schoolroom classes supplement shop work to give the apprentice a well rounded training

"YES, I'M AN APPRENTICE . . ." That's about all I need tell any young fellow nowadays, and he'll look at me, his eyes full of pity. Immediately his mind seems to conjure up a picture of a dark, damp factory—full of noise and confusion, a place reeking with the smell of oil and tobacco juice. And as he envisions me chained to some fantastic machine, his heart goes out to me. Poor fellow, he says to himself.

I've been an apprentice for over a year now. Frankly, I feel, as do my colleagues, that we are to be envied rather than pitied. Things are not like they were when father "served his time." We work in a modern plant, amid the latest machinery, under the most sanitary conditions. We are receiving an education, a rich education. Furthermore, we are paid a fair wage for our services, and we enjoy the advantages and privileges of other employees. Certainly we are not the slaves some folk would make us out to be.

But please don't misunderstand me. Most of us do work hard. That, of course, is expected of us. And sometimes I wonder whether we apprentices do not work harder at our jobs than do regular employees. To us each new job is a new, difficult problem, to be solved accurately and with as much dispatch as possible. Ours is the double duty of working, yet absorbing every new experience.

Apprenticeship training throughout the country today may be divided into two distinct parts. Under one system, the young men and their instructor are huddled together in some separate part of the plant in a department all their own. In the other system, the men are scattered throughout the plant, working on production jobs, alongside regular workmen.

Each system has its merits, I suppose. The members of the course to which I belong, happen to work under the latter system, and I'm sure most of us prefer it. Under this "stagger" method we are brought face to face with actual cases and meet "on the job" requirements. We

work under men who are specialists at their particular operations. With their suggestions supplementing the information of the instructor, we get a well-rounded knowledge of each machine. The rest comes with experience. I think such a system is better because it gives the student greater satisfaction in his accomplishments, knowing that he is useful and actually producing something of value, something that will be used.

Something might well be said here of the fine treatment accorded us by the co-workers in our shop. We have found them always willing to help—to answer a question. They seem not at all resentful of our presence as long as we do not displace other workmen. And the management makes sure we don't before we start. Indeed, our relations with our fellow workers have turned out most friendly.

Getting Acquainted

There is a tendency at our plant to employ as apprentices high school graduates that have had little or no previous machine experience. They prefer to train us in their own way. Consequently the beginning of the course is spent in getting acquainted with tools and getting over "machine shyness." The beginner usually starts off on a drill press and from then on is rotated among the following machines, spending as much time at each as is necessary to master it; lathes, milling machines, shapers, punch presses, screw machines, surface grinders, boring mills, universal grinders; he also gets bench work and sheet-metal work.

Since the instructor obviously cannot spend all his time with one individual, each student is left largely under the supervision of the departmental foreman. This foreman doles out the student's work, outlines if necessary the operations to be followed on it and checks the completed pieces. He follows the progress of the boy closely. At the end of each week he receives a written report from the student listing the things learned by him during the week and advancements are made accordingly.

In conjunction with this shop work, most courses include a certain amount of schoolroom work. Our related work includes seven hours a week over a three year period divided among machine theory, shop mathematics, algebra, geometry trigonometry, elementary electricity, strength of materials and drafting. The class is conducted at a nearby public vocational school during regular working hours.

As to rate of pay for the apprentice, a concensus shows that the average wage rate is about 40 per cent of the prevailing rate for journeymen machinists to start, with increases periodically thereafter. In addition, some firms have instituted a bonus system whereby outstanding work is rewarded. Others pay off on new ideas for increasing the efficiency of the plant. This "suggestion" system has found much favor and is profitable for employees and employers alike.

Yes, I'm pretty well "sold" on my job. Yet it is a fact that young men today, high school graduates particularly, are loath to "learn a trade." They and their parents can see no advantage in an apprenticeship of three or four years, believing as they do, that it leads only to the usual mechanic's wage. They are not fully aware of the opportunities in the metal trades today. Yet ask any employer, and he'll admit that he is faced with the acute problem of finding enough highly skilled men to fill key positions in his business. Deaths, retirements due to old age, and the almost complete abandonment of apprenticeship training since 1929, have greatly depleted the ranks of skilled craftsmen. The average age of available skilled workers has increased to more than 45 years. New, young blood is indeed needed.

Quick Advancement

Moreover, apprenticeship certainly does not indicate a future that stops at machine operations. If one were to look at the personnel of the concern I work for, or the personnel of any other concern for that matter, he would find a lot of men "at the top" who started at the bottom. A majority of the executives, sales engineers, designers and foremen have come from the apprenticeship ranks. Advancement in this field is fast and prompt. Men here are advanced just as quickly as their ability and training warrants. It stands to reason that with each bit of added knowledge a man acquires, he becomes more valuable to his company. In an industry so badly in need of that knowledge, it would certainly be unwise and unprofitable for any organization not to take full advantage of it.

For a young man unable to attend college yet desirous of entering the mechanical field, apprenticeship offers an excellent opening. It is not all fun. It means work and study. In many cases it means a sacrifice of money at the start. Still, it is stimulating. Witness: Out of thirty apprentices enrolled at our plant in the last two years, only one has left voluntarily—and he to attend college.

Where Surface Affects Accuracy

Most of us have become accustomed to thinking of accuracy and surface finish as two distinct factors in production. While this may be true in some classes of work, in the case of press fits they have a direct bearing on each other. This is shown very clearly by the difference in pressure required to force an axle and wheel together with surface finishes of various kinds.

A study of wheel-fit surfaces of discarded axles will show some shaved the whole length by the hub, others with contact marks only on the top of the tool feed marks.

Even a moderately smooth turned axle requires considerably less pressure than a ground shaft of the same measured diameter. This is because the ground axle has a more uniform surface. There is almost no flow of metal in the axle due to inequalities found in the turned axle. Then too, the ground surface presents less opportunity, in the shape of what we might call "pockets," to hold the lubricant used.

Effect of Lubricant

This question of lubricant has many variables and presents undesirable opportunities for jockeying wheel fit pressures. Railroad shop men tell of wheels that have been put on with pressures below the prescribed minimum, that were jockeyed by the lubricant. They tell of pressing off such wheels, using a different lubricant and in this way making the pressure run up to the prescribed limit. Improvement of the actual fit by this method is doubtful. It might have saved time to make a false entry on the record and might be considered just as honest. This would, of course, be impossible with a press having a pressure recorder as many now in use do. It is probable that, in such cases, the low record was destroyed. This could be detected by having the record numbered consecutively.

One maker of large machinery overcomes any jockeying with lubricant by electroplating the shafts with copper to a predetermined thickness. No lubricant is used, the copper coating preventing abrasion of the mating surfaces by reducing the friction encountered in driving.

TALKING SHOP

Blow the Man Down!

Many of us remember when magnesium was only a flash powder for photographing in dark places. We set one off in the engine room of an old monitor at League Island and nearly got in the hoosegow. Now we use it for important parts of airplanes, for vacuum cleaners and other machines. But it still recalls the flash powder days when you get the chips too fine. And shops using it take different kinds of precautions as to its use. One shop started

with a bucket of sand beside the machine but soon found that sand wasn't the best thing to throw on a machine tool. Others use granulated cork.

One shop makes it a rule to keep chips in a steel box and to dump these into a metal storage bin in the yard at frequent intervals. But this doesn't take care of the magnesium dust that collects on the operator's clothes. So they send him to an outdoor place every hour and dust him off with an air jet! Sounds a bit funny perhaps but it adds to the safety of the whole shop.

Magnetic Super-hardening

New ideas sink in slowly, even with the most progressive—which not only causes disappointment to inventors but is responsible for many busted bubbles in the manufacturing field. We can all think of methods and machines in use today over which inventors spent hours of labor, and backers spent wads of cash.

A recent example of this kind is the use of magnetism as a method of securing superhardness of steel parts, after the regular hardening has been done. Experiments along this line were published in the *American Machinist* in 1931 and '32, the work of Edward G. Herbert, well known in steel treating fields in Great Britain. Now, after five years, a few people are beginning to sit up and take notice of the process. This shows progress, as it is frequently much longer than this before new ideas receive any sort of attention.

Vacation or Bonus?

Vacations with pay, long desired by hourly workers, are rapidly becoming an established fact. Some have come about through union presure, many more through free action of individual employers. It has been taken for granted that the employees would rather have the time for recreation than more money and no vacation. But the too rapid shortening of work weeks to 40 hours and the reduction in overtime have reduced the contents of a good many pay envelopes.

Actual figures on employee

choices between paid vacations and doubletime bonuses instead of vacations have just been announced by the Acheson Colloids Corporation of Port Huron, Michigan. Here the employees had a choice of vacation with pay, work at double pay, or a combination of the two. 22 per cent took the vacation, 22 per cent took a 50–50 vacation and bonus split, 56 per cent took the bonus and passed up the vacation. The older men who had earned longer vacations took some part or all of the vacation time, while the younger men preferred the cash.

Stretching Lots

Backlogs in the machine tool industry being what they are, it is still necessary to stretch lots as far as possible in an endeavor to meet customer demands. Obviously the current recession will relieve the situation, and may cure it entirely if it goes far enough, but the practice is one that is sure to be resumed when confidence returns and orders that have been held back are rushed through.

By holding spoilage to the absolute minimum one shop which we visited recently has succeeded in getting twenty-five complete ma-

chines out of a lot of twenty-four, In one instance it also succeeded in getting sixteen from a lot of fifteen ordered through the shop. When times were brisk a few weeks back, it tried to secure seventeen out of a fifteen lot, and almost got away with it. A little practice now may help later.

Modern Small Shop

Just the other day we saw a small machine shop in a Ford dealer's garage that was a model of cleanliness and efficient equipment. The owner is a firm believer in replacement of machines as rapidly as better and more efficient ones appear. Ames dials are used to check valve seats. High speed diamond grinders refinish tungsten alloy valves and seats. Metallic spray guns are used to fill dents in bodies which normally would require the tearing down of upholstery to get at them. High speed hammers are used for straightening fenders. Engine analyzers with stroboscope attachments for checking distributor points are in daily use. What really floored us was that the bucket of gasoline and grimy rag of old has been replaced by the latest model degreaser for cleaning engine parts. Whenever an engine is lifted from the car it is placed in the degreaser for thorough cleaning before the mechanic starts working on it. *The Editors*

Production-Wise Molding

Over-all economy rather than maximum pieces per worker is the philosophy of a custom molding shop

HERBERT CHASE

FACILITIES FOR custom molding at the plant of the General Industries Company are unusual both in respect to the quantity and variety of equipment installed and in aid received from the metal-fabricating division. This plant, as a whole, concerns itself with the manufacture of several products made largely of metal. Only a small part of the output of its plastics division goes into its own manufactured items. But the extent and variety of its products makes this division one of the largest custom molders in existence. Combination of full machine shop and molding equipment makes it possible for the company to handle the entire custom contract under one roof. Molds and stamped or screw-machine inserts, which may be plated if desired, are made in the plant.

The plant has excellent facilities for making and heat-treating molds. In the case of small parts, particularly, molds are often made from standardized blocks fitting into standard chases and adapted to standardized press equipment arranged for quick setup. This makes it possible to handle short-run jobs with remarkable efficiency and at prices relatively close to those for long-run products in which large multiple-cavity molds are employed. So well is the mold department organized that, for hurry jobs, molds can sometimes be completed within two days or less and usually with less delay than is common even when the molds are necessarily complex. Estimating is also facilitated and expedited by doing the entire job under one hoof.

Some idea as to the volume of molded products turned out can be gained when it is stated that there are on one floor 72 presses of which 22 have 16-in. or 17-in. rams. All except six hand presses among the remainder have 12-, 10- or 8-in. rams. In addition, on a second floor there are 54 pneumatic presses of a quick-acting type, eight hydraulic presses with 7-in. rams and three Isoma machines for injection molding.

There is also a well-equipped cleaning department in which many machines, some of them especially designed for the purpose, are employed for removal of fins, polishing and such machine work as may be required on the moldings before delivery. Considerable hand cleaning is done, of course, but machines are used wherever they are faster or do a better job than can be done economically by hand.

Both of these parts are cooled over fixtures to maintain required dimensions. One is a header molding for an Electrolux vacuum cleaner and the other is the handle for a Westinghouse flatiron

Extra-Hard Preforms

Approximately 90 per cent of the plastics used are preformed. This work is done in a separate department adjacent to the receiving room in which the molding materials are stored pending use. Four Coulton machines are employed for preforming phenolic compounds and two of the same make, in a separate room, for pilling the urea plastics. Preforms are made in many odd shapes to fit various mold cavities and there are on hand over 600 dies (or molds) for preforming alone. These are designed to give an extra hard preform (that is, one which is unusually dense). This has been found to reduce the fluxing time in the mold by helping to conduct the heat rapidly to the interior of the preform, thus shortening the molding cycle. A separate room for weighing materials such as rag-

filled stock, which cannot be preformed, and loading the mold charges into cups is also provided. The cups are loaded into tote boxes —as are also the preforms—for transfer to the molding departments.

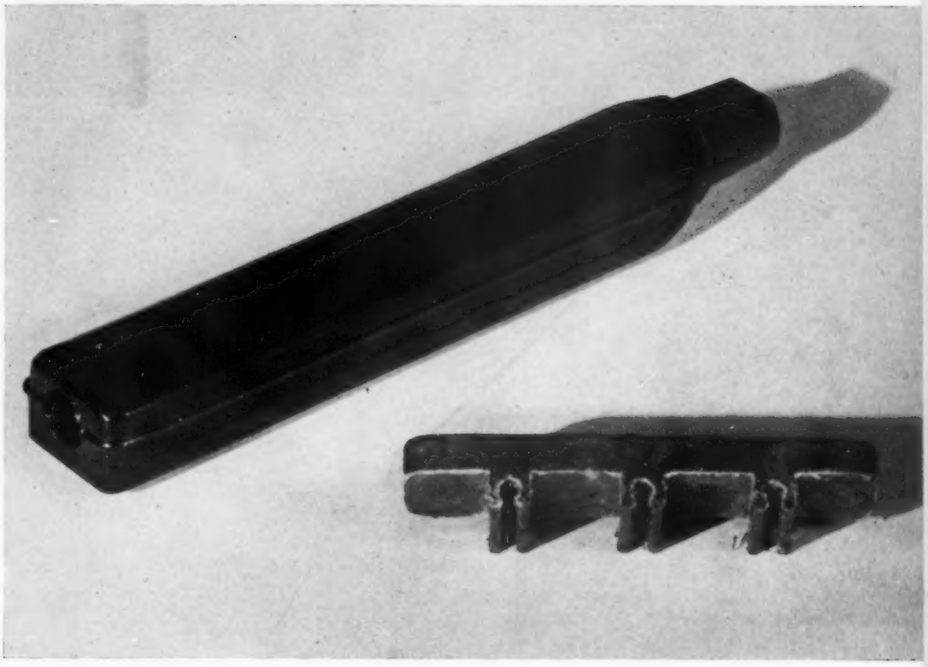
In a plant where so many moldings are produced it is difficult to select products sufficiently diversified as to give a satisfactory picture of these in their entirety. The following, are fairly representative and also give some idea of methods which, in some cases, are rather unusual. Efforts are made, as a rule to realize over-all economy rather than to gain in all cases the maximum number of pieces per molder employed. For this reason, the molders generally tend only one, or at most, two presses. The work is laid out so that during the cure the operator is either preparing a new charge, cleaning flash from moldings already produced, or both, or doing other productive operations.

Loading frames are used for the charge when this results in economy. Such frames are also used in some instances for inserts, or these are placed in holes or recesses in the preforms so as to assume correct position in the molds. In other cases, where hollow or cored parts can be formed with removable pins, an extra set of these pins is provided. While one set is in use the other set is removed from the preceding group of moldings. Many core pins are threaded, when the molding requires an internal thread. A quick-acting, power-driven chuck for unscrewing the insert is placed beside the press so that the operator can remove the pins quickly while the second set are in the mold. This not only gives a clean thread but avoids the need for subsequent tapping, that yields, as a rule, a thread which is not so smooth.

Three Side Cores

Typical of good practice in a rather difficult molding job is the Westinghouse flatiron handle. This is produced in a four-cavity mold, each cavity being provided with three side cores. These, of course, have to be removed with the moldings. The latter require a 3-min. cure, timed with an hour glass. To prevent warpage in cooling, these moldings are placed in a special screw-clamp fixture while jets of air are directed on them.

Another molding requiring side cores is the head for Electrolux vacuum cleaners. These heads are produced in a three-cavity mold running on a 5-min. cycle of which 2 min. is consumed in the cure. In this case, cooling is done under an electric fan and metal plugs are placed in the recessed part of the molding to hold the opening to size while it shrinks around the plug in cooling.



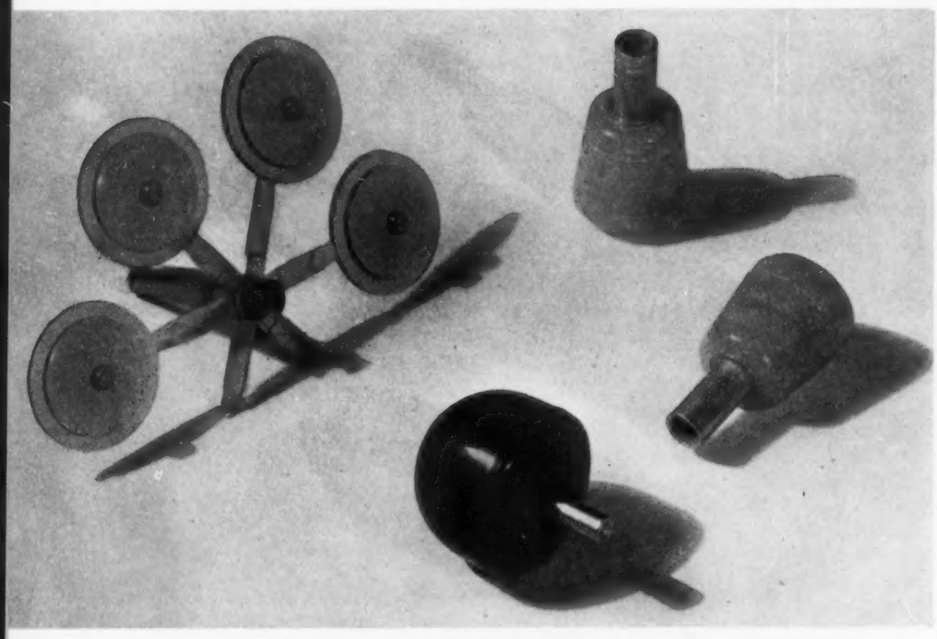
These are phenolic moldings. The 5-in. cooking-utensil handle has a cored hole from end to end. The other piece, a key bar molded from fabric-filled material, has undercut dovetails that complicate molding

The molding of keys for an adding machine might be considered rather simple. It presents some problems, however, when done in a 34-cavity mold in which each cavity forms a separate character, includes a small insert, and characters must be kept separate when removed from the mold. In this case, the moldings are lifted out on a common bar forming part of the mold. This bar is then laid across a sorting box with a compartment for each character. Although the cure for these moldings is only 1 min., the cycle runs from 3-10 min. because of the care required in cleaning the holes for the inserts and placing them in the mold cavities.

Molding of parts with under-cuts always presents problems, and these are usually multipled when fabric-filled, inpact-resistant molding materials are specified. These problems are neatly solved in producing a key-bar having three projections on its lower surface through which run under-cut slots. In this instance the bars are produced in a six-cavity mold with the pieces molded bottom up. A weighed charge is provided for each cavity, and it requires tamping into each cavity. This is done with a wooden force having six projecting blocks which ram the charges into the respective cavities before the steel force forming the upper half of the mold is lowered. The wood form is then removed and the mold closed in the usual way. The steel force has, of course, a steel block fitting each cavity and on the under side of each block are three recesses. In the center of each recess, and like them running the full width of the block is a necked rib or dovetail with rounded corners forming the undercuts referred to. Because of the undercuts, when the mold is opened after a 2-min. cure, the moldings come away with the force and can be tapped off sidewise, parallel to the recess and dovetail walls, leaving the undercut in the moldings as desired.

Long Central Hole

Another somewhat unusual molding is a long (5¼-in.) hollow handle for cooking utensils having a straight central hole from end to end. These handles are molded flat around horizontal pins which are ground and polished to facilitate removal. An extra set of pins is used and while the cure is proceeding the extra pins are slipped through sets of ring-shaped preforms stacked in a convenient rack. After the mold is opened and the moldings removed, the pins, of which there is one for each of the twelve cavities, with preforms already slipped over them, are put into the mold and it is closed. While the cure proceeds, the molder taps the pins out of the previous set



Cellulose-acetate lenses are injection-molded six at once, using a central riser and six sprues. Instrument-panel knobs are likewise produced by injection or compression molding

of moldings and loads a set of preforms on them preparatory to the next charging. In this way it is possible to produce twelve handles each 6 min., allowing a 3-min. cure.

Standard Mold Chases

Air-operated presses are used chiefly for molding small parts. These presses are characterized by much more rapid operation than the hydraulic type, and create 40 tons pressure through a toggle mechanism. Molds are mostly designed to fit into standard chases with standard steam connections, knockout parts and stripper parts when required, all arranged for rapid and convenient setup at minimum cost. In most cases they have a series of blocks, themselves standard as to size, which are used for separate cavities, making for rapid and economical mold production. These presses are arranged in two rows with an operator between each pair. In most cases an operator can handle two presses. Besides being rapid, these presses are easily controlled. There is no handling of molds and, as the parts are light, many of the operators are women.

All of the molded parts already referred to in detail are produced in bakelite molded. Urea compounds are also employed when light tints are required, the procedure being virtually the same as for phenolics. In addition, much work is done with cellulose-acetate compounds, which are used exclusively for injection molding. Compression molding is also done with acetate. Although this involves both heating and cooling the mold, the large number of cavities often employed for small parts makes it possible to equal or exceed the rate of production possible with injection molding. The quantity of material per "shot" in the latter is at present limited to about 1¼ oz. and about five shots a minute is close to the maximum possible.

In compression molding with acetate, both the heating and the cooling cycles are shortened by minimizing the amount of metal in the mold blocks. These blocks are cored for circulating steam and water alternately, of course, but instead of depending on cores only, the channels are connected with external copper piping with brazed joints and suitable header connections.

Acetate Instrument Panel

One of the largest acetate moldings made in this shop is the instrument panel for Graham cars. This measures about 7x14 in., and is flat except for a semi-cylindrical section through the center in which the instrument openings come. This molding has ten brass inserts for fastening purposes and is formed in a single-cavity mold. The charge consists of a strip of acetate sheeting plus a small amount of granular acetate of the same maroon color, the sheet being warmed on a hot plate. Steam flows through the mold while it is being charged and for 1½ min. after the mold is closed, giving a total of about 3 min. of heating. This is followed by cooling for 2 min., hence about twelve pieces an hour are turned out. With this cycle the operator has time to clean all flash from the moldings between chargings.

25,000 Per Day

In another acetate mold built up from ten blocks having ten cavities each, thin disks or "lenses" about 1 in. in diameter are produced at the rate of about 25,000 a day. They are used to cover the end of other molded knobs having wiped-in lettering which the lenses protect from scratching, being held in place by a metal bezel. With the external piping, this mold cools from the molding temperature of 340 F. to 110 F. in 1½ min. The mold is chromium plated and highly polished and produces lenses with a similar polish and excellent clarity.

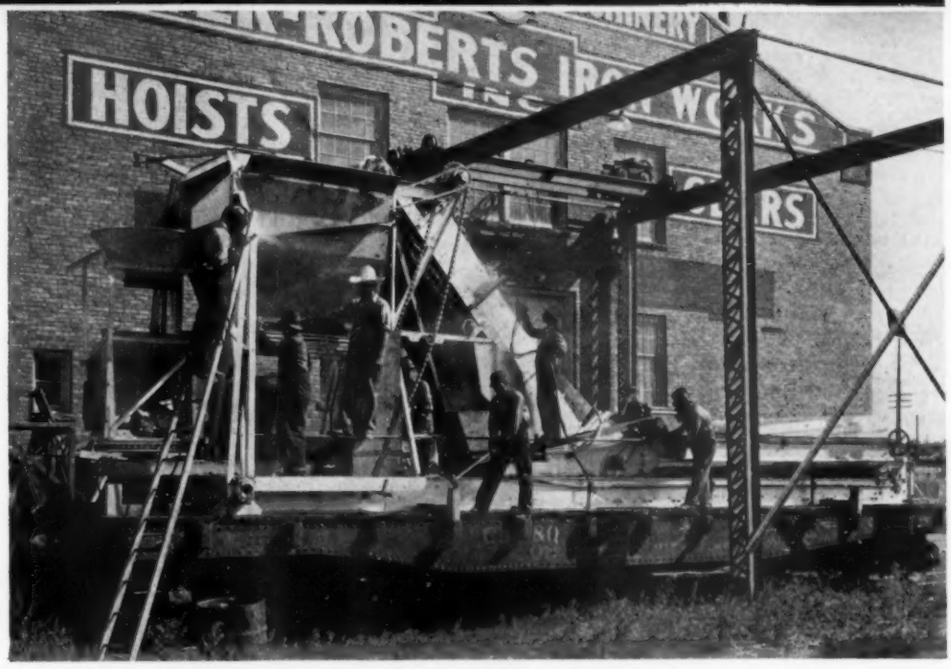
Knobs for Buick instrument panels are produced in a somewhat similar mold in smoked gray translucent acetate, each with a straight stem insert. Similar parts are also produced in the Isoma injection molding machines. For knobs, the mold used in this machine has six cavities each taking one insert. The rate of molding is about 570 knobs an hour. As this is about as fast as acetate can be heated, the time for placing inserts does not slow the operation.

The same machine, which uses, of course, a mold that is water cooled continuously (that is, never heated) turns out about 1,900 lenses an hour from a six-cavity mold, thus running at a little over five shots a minute.

In the cleaning department many parts of circular sections are quickly cleaned of fins in lathes with foot-operated chucks, the girl operators using a hand file. Some knobs have grooves turned in them on lathes of this type, the operations being very fast in either case. Tapping of some holes is done very rapidly in a Haskins tapping machine, some work running as high as 700 tapped holes an hour.

One end of the cleaning room is given over to work in which lettering and designs are wiped into recesses made in the moldings for this purpose. The work is done by girls who use medicine droppers and brushes to feed the quick-drying pigment to parts set into racks.

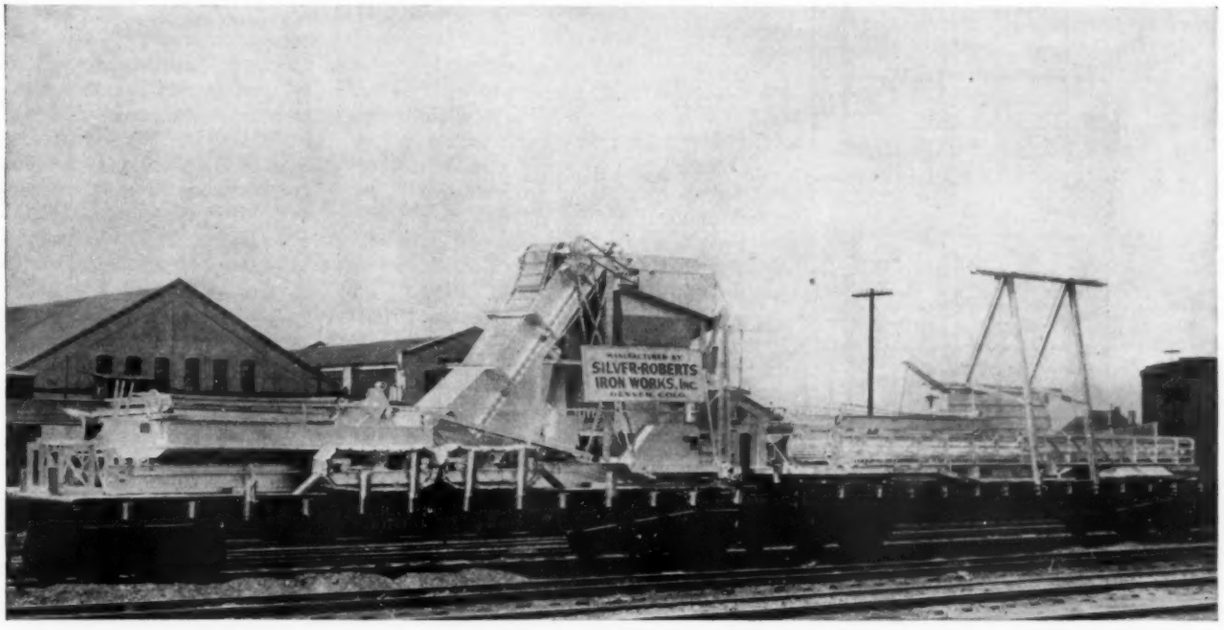
ASSEMBLING AND PAINTING ON FLAT CARS



Final assembly and spray painting of sugar beet loader on the company siding

SUGAR BEET LOADERS are bulky machines but they go together rather quickly once the subassemblies are completed. In the shop of the Silver-Roberts Iron Works in Denver, where these units are built, assembly space is at a premium. Consequently the practice is to assemble the loaders on the flat cars that will carry them to the customer. It is seldom necessary to hold a car more than one day. Men at the customers' plant who have unloaded these machines and have found out how easy it is to mar the paint on them sometimes wonder why they arrive without a scratch. The answer is that the final spray painting is done outside the shop on the flat car. Incidentally this practice is effective in keeping paint fumes out of the shop.

A completed wader, with its accessories occupies two flat cars. Here is one ready to leave the factory



Stoker Maintenance

A special press and special turning tools cut the time of reconditioning this important locomotive accessory

JOHN LEWIS
Gang Foreman, Chesapeake & Ohio Railway Company

MECHANICAL stokers have become an essential part of all large coal-fired locomotives, and their maintenance is as necessary as that of the locomotive itself. When locomotives are overhauled, the stoker is completely torn down, the conveyor worm is built up where worn, bearings are replaced if necessary, and the whole machine thoroughly tested before it goes back into service.

For removing the gears and bearings, the press shown in Fig. 1 is used. It consists of a frame mounted on legs of a convenient height, with

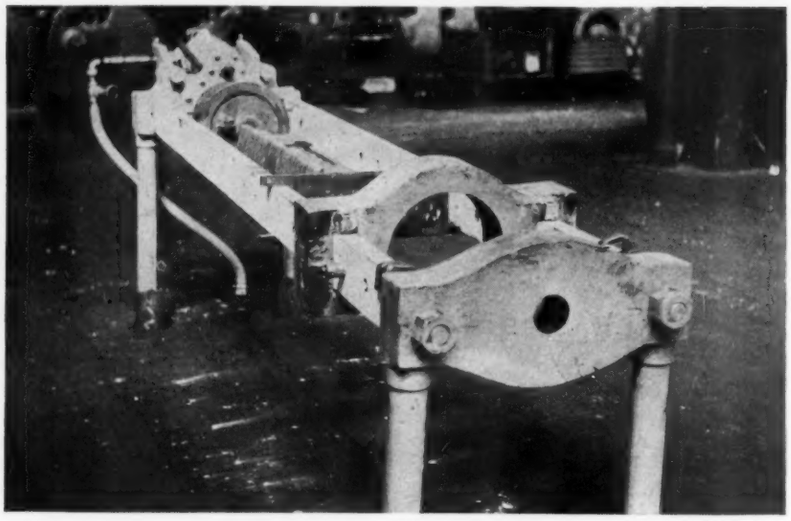
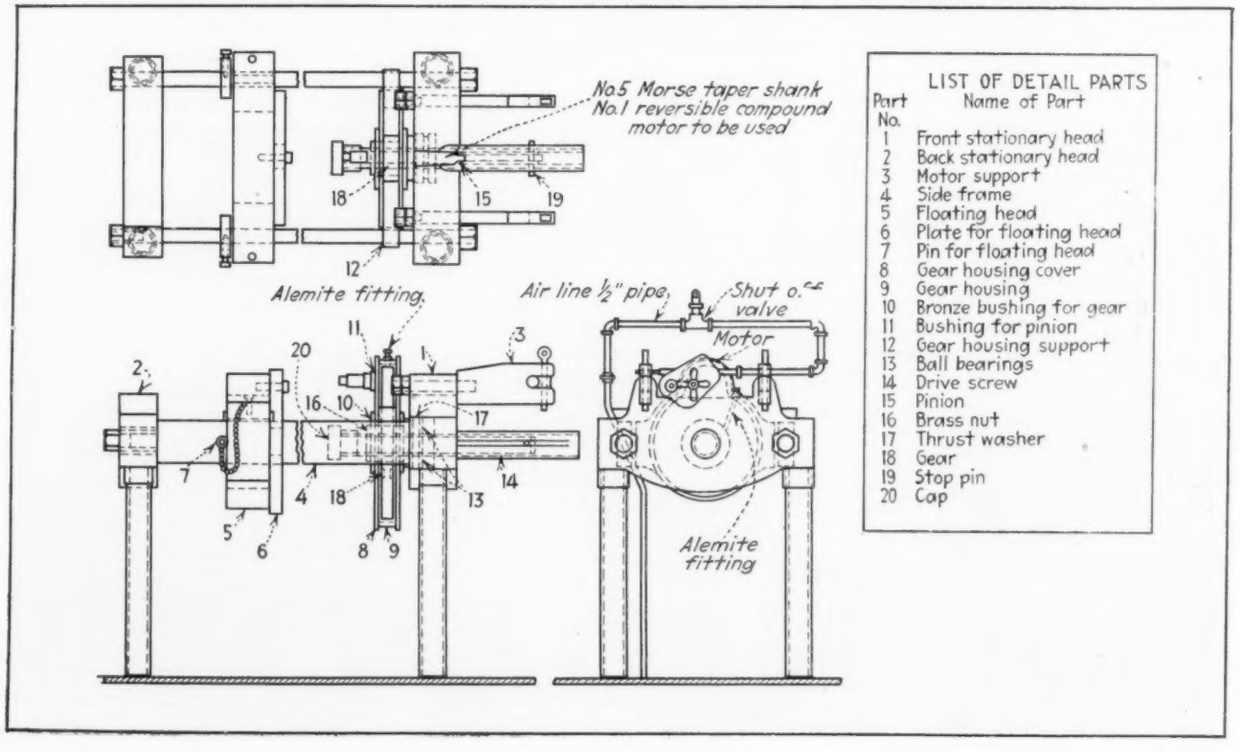


Fig. 1—A special press for dis-assembling the motor unit of mechanical stokers combines means for supporting the stoker and pulling bearings and gears for inspection

Fig. 2—The general plan of the stoker dis-assembling press shows the principal parts named



LIST OF DETAIL PARTS

Part No.	Name of Part
1	Front stationary head
2	Back stationary head
3	Motor support
4	Side frame
5	Floating head
6	Plate for floating head
7	Pin for floating head
8	Gear housing cover
9	Gear housing
10	Bronze bushing for gear
11	Bushing for pinion
12	Gear housing support
13	Ball bearings
14	Drive screw
15	Pinion
16	Brass nut
17	Thrust washer
18	Gear
19	Stop pin
20	Cap

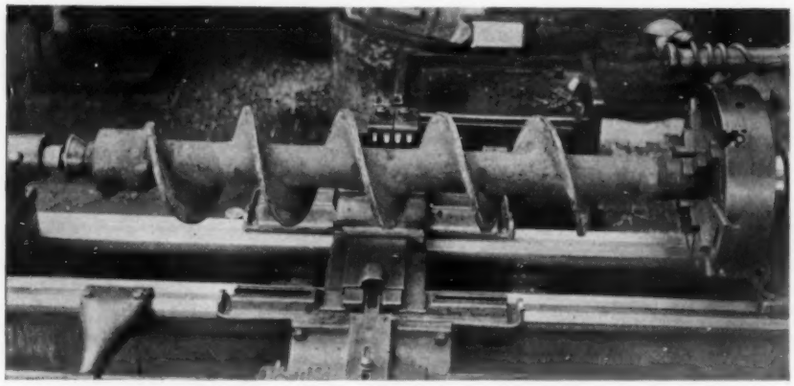
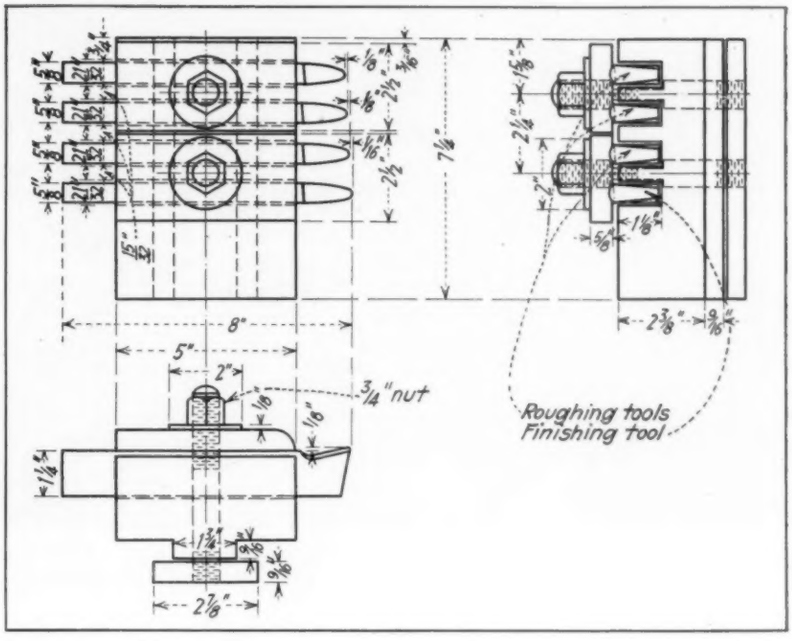


Fig. 3—After the conveyor screw has been built up with a torch to bring it back to size, it is turned with special tools to fit the stoker body. Average turning time, 20 min.

Fig. 4—The four tools used for turning are mounted in a special tool block with each tool set so as to remove the right amount of metal

crossbar supports for the stoker unit. Suitable clamps make it easy for the air-motor driven device to pull the gear from the conveyor shaft and to remove the bushings in the bearing at each end. Principal details of construction are seen in Fig. 2.

Special tools are used for turning the outside of the conveyor screw after it is built up by the torch or arc welding. Four tools are used in the gang tool block shown in Fig. 3. Details of these tools are shown in Fig. 4. There are three roughing tools and a finishing tool. These four tools are set in a special tool block with the cutting edges projecting in steps, as seen in the plan view. The first tool leaves $\frac{1}{8}$ in. for the second tool, which also leaves the same amount for the third tool. This is set to leave $\frac{1}{16}$ in. for the fourth or finishing tool. The tools are held in pairs as shown, and can be easily reset after removal for regrinding.



Arc Welding Shows Gains

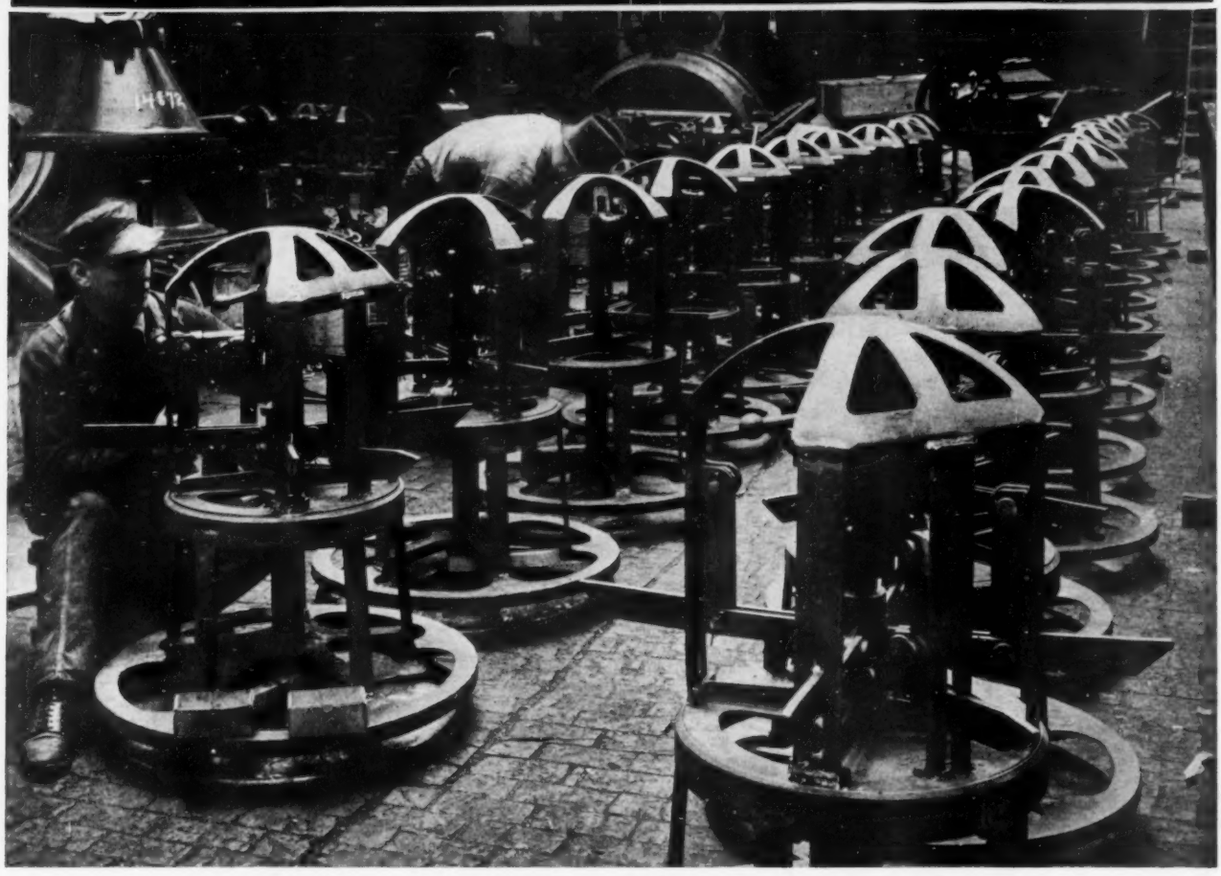
True to predictions that were made for it a decade ago, electric arc welding has been making tremendous strides in extending its field of usefulness. The growth in volume in the past five years is clearly shown by the NEMA reports of electric welding wire consumption, from 18,800,000 lb. in 1932 to 111,000,000 lb. in 1936. It is thought in some quarters that there will be recorded a further 50 per cent increase when the total for 1937 is known. That this progress is not all due to the general revival of industrial activity is shown by the steady increase in volume of consumption in the early thirties, before any real revival had started.

A more graphic proof is the increasing amount of electrodes being used for each ingot ton of steel poured. In 1932 the figure was 1.4 lb. of electrode for each ingot ton; in 1936 this figure had reached 2.4 lb., an increase of 71 per cent. 1937 activities indicate that the trend is still definitely upward. In general, this growth may be ascribed to the fact that the shielded arc process makes possible a quality of weld deposit that has won engineering acceptance in nearly all the major fields of steel construction and fabrication.

Show the Way

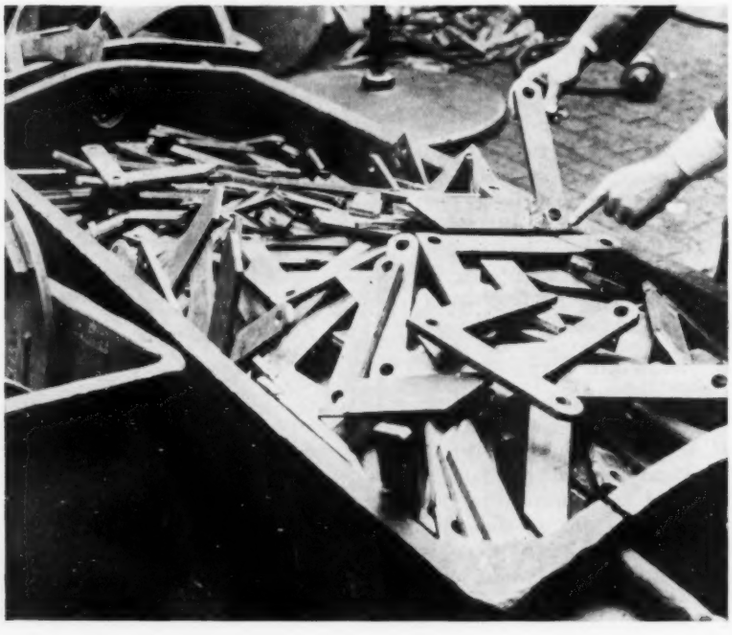
Prominent naval engineers have stated that the riveted ship is on the way out, barge and tanker construction for inland waterways is largely an all welded job, railroad freight cars are being welded in thousand lots, the petroleum industry is building larger pressure vessels whose service practically demands arc welded construction and approves the process for fabrication of all kinds of containers and piping systems, machinery from the smallest up to the most massive mill equipment is using welded structures to replace castings. These high spots are showing the way and establishing confidence in arc welded structure.

ARC WELDED WIRE REELS



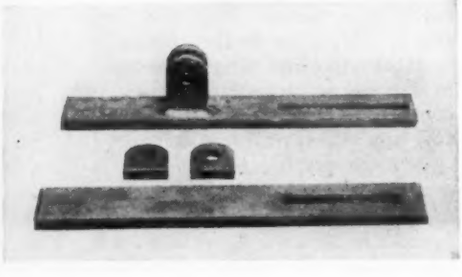
The dome like structure at the top of the reel is cast steel; the balance is welded from steel plate using Lincoln shielded arc equipment

Levers are made from two pieces of standard flat stock cut to shape



Built by the Wellman Engineering Company for one of the largest producers of steel wire, these reels furnish an excellent example of how arc welding can be utilized

Arc welded construction permits stacking the bracket lugs when drilling instead of the individual operation that was needed on the cast construction formerly used



ROUND TABLE

Loyalty—An Asset

"Ed, here's an article on employee relations that's full of suggestions. The author is a well-known employment manager who has made a hobby of studying the men who come to him looking for work.

"He believes that employer-employee relationships must be more than just plain business. This article deals principally with the subject of loyalty and tells of what can be done to put this asset to work."

"Al, you're always getting your head up in the clouds. Better stay down on solid ground and take things as you find them. No matter what these experts try to sell you, the fact remains that money talks louder than fair words. The men will go wherever they can get more in the weekly envelope."

"You're always a pessimist, aren't you, Ed? Why, there are a lot of men who look at the company they work for as their own and do a lot to improve its products. They don't try to find other jobs that pay a few cents more an hour, either."

"Some of the older men, who learned their trade years ago, are that way, Al. But, nowadays the average workman believes that loyalty is something that works only one way. They've had to take pay-cuts and have been laid off with what seemed like little consideration.

"The only way to interest them is to offer them more money. They consider their work in a purely business fashion."

"This writer points out, Ed, that non-financial incentives and a carefully fostered feeling of loyalty go a long way toward making any plant a better place in which to work. Any man will do a better job if he feels that he's a part of the organization, rather than just another cog in the wheel."

"Sure he will, Al; until you tell him that business is slack and he can work only two or three days a week. His loyalty is apt to lose itself in his fears when that time comes. Better have him feel that he's working

for the money he earns than feed him a lot of 'soft soap' when times are good and then fire him when they aren't."

"Guess that's why you stuck with Williams during '32 and '33 when you had those offers of more money up in Rochester. What kept you from leaving, if it wasn't loyalty?"

"Part of it was the trouble of moving, Al. The rest—well, Williams has always been square with me. But that is something else, you can't expect the average man to feel that way, Al."

"We're all the same, Ed. We all like to be treated right and to be made to feel important. Here, better take this magazine home and read that story."

Are management-employee relations best handled as purely business? Should a company foster a spirit of loyalty among its employees?

DISCUSSION

Rolling Stones

Shop policy and nature of product must be among the factors considered in determining whether the "rolling stone" is to be rehired. Both the steady workmen and the "rolling stone" are useful under the right conditions, and it is possible for both to work contentedly in the same shop.

Where the shop is conservative in character and does not desire to make changes in either product or methods, the steady workman is the type required. On the other hand, if the shop is "alive" and varies its products, either through necessity or improvement, the "rolling stone" has an opportunity to exercise his ingenuity.

This is especially true in the general shop where products are made in small lots and are varied in character. Where the shop is engaged on a specialized class of work, or where the work is limited to a few types, the progressive type of manager would plan all operations in advance of production. Thus, there would be no need to engage the "rolling stone" as any desire on his part to use his own tricks would be stopped.

The "rolling stone" is usually restless, impatient, and generally impolite, but there is a chance for him to work in harmony with the slower, methodical steady worker providing conditions are suitable to both. The steady workman would be given the repetitive operations while the "rolling stone" would handle the tricky operations, such as scraping in dovetail slides and making special tools.

Keep the steady man for twelve

months and you will get a conscientious, methodical, unchangeable workman. Keep, if you can, the "rolling stone" for the same period and you may get a very live foreman.

—W. A. HARRIS
Allesley, Coventry, England

While it is discouraging to have a good mechanic walk out at a time when everything seems to be going smoothly, it is mighty comforting to have him walk back in again when he is badly needed. Every time he comes back, he brings more than he had when he left. He can usually show many of the "stay-puts" some new tricks.—W. E. FISCHER

Apart from the fact that they frequently change jobs, "rolling stones" are frequently good workmen. I can see no reason why a foreman should not rehire a workman whose only reason for leaving was restlessness. At least the foreman knows what he is getting and the man will not require as long a time to break in as a totally new man.

If kept too long on one job, many men become irritable and discontented. While men of this sort often make other men discontented, a change of work is necessary for them. The rolling stone is often of great value to his employer because of his wide experience in different shops. He usually loses in the end because constant changing about costs money, and he may lose promotion by being constantly on the move. —W. E. WARNER
Worthing, Sussex, England

Off to a Good Start

Sam Evans will have to learn the technical details of the new welding group, so it would be well for him to get in on the ground floor and help to work out the bugs. Having been in charge of his department for so many years, Sam has no doubt placed his men where they can work to the best advantage. Turning his department over to another man, even for a short time, may create a chaotic condition that would take a long time to remedy.

—ROBERT KNOTEK.
Foreman, Die Department
Cleveland Division
Fisher Body Corporation

The fact that Sam has directed the activities of his department for 15 years should give him confidence in his abilities, providing he has sufficient technical skill and ability to handle men. Placing Jim in charge of the group will, in the end, be of much advantage to Sam, since it will help him get the group running smoothly in a short time. Sam will be able to take over control of the group in short order, if he cooperates with Jim and becomes familiar with the operations being performed.

—ANTHONY J. KONICKI
Frigidaire Division
General Motors Corporation

A good foreman naturally does not approve of any set-up, temporary or otherwise, that leaves the impression that he is not fully capable of running his department. However, sometimes it is necessary to take advantage of the experience of an expert to obtain the best results. This may be done by having the specialist act as a councellor to the foreman, rather than as a superior.

The specialist knows the details of the new processes that are going to be put into effect; he is not necessarily a good supervisor. The foreman on the other hand, knows his men and his department. With the expert's advice, he will soon master the new technique.

To obviate unnecessary bad feelings, Williams should explain fully the reasons for placing the specialist in the welding department, to act as councellor to the foreman, and should make it definitely understood that the new set-up is temporary. He should point out that the arrangement will be in effect only until such time as the department is again running smoothly.

It is doubtful that the foreman will give the specialist his full cooperation if the specialist is placed in charge of the department. The foreman is sure to feel slighted. Best results will be obtained only when the two men work together in harmony. —NILS H. LOU
Tool Room Foreman
The Glen L. Martin Company

New Man

In every shop there is a man who will insist on telling any new man all about the peculiarities of the shop. Why should Al pay Jim a foreman's salary to take the new man through the shop when the "old-timer" can do it just as well?

This man, known to old-timers as the shop "blabber mouth," will know who has the special wrench that is needed to tighten the clapper on the shaper; that the Super likes to talk about fishing; that the chief inspector will go a long way for a meal of fresh fish; and that you can't start the power saw in high gear without blowing out a fuse.

—J. W. VAN DOREN

Bird in Hand

Old reliable customers should not be neglected under any circumstances. Customers of long standing, on whose business one can depend through thick and thin, are a genuine asset to any business. The sellers' market that exists today requires careful planning and mutual understanding on the part of both the purchaser and the manufacturer, and the extent to which established customers anticipate their requirements will determine how much extra work can be handled.

I believe that a certain percentage of capacity must be reserved for unexpected and unusual demands on the part of the customers who must be served in order to establish the stability of the business. It is poor psychology to flatly refuse an order. It is better to accept it under certain terms with an explanation of the reasons why the terms are made. In case these terms are not prohibitive, and they fit in with the possible schedule of the purchaser, then the company is just that much ahead. —O. W. WINTER

The Chemist Helps to Prevent Rust

Temporary protection against corrosion is often important. The old "slushing" mixture of white lead and oil was fairly effective for long time coverage, but it was a nuisance to get off, which made it unsuitable for temporary use. Then came a sort of blue paint that was used for pulley faces and the like. Used in this way it was left for the belt to take care of it.

Now we have concerns who specialize in protective coatings. They make fairly hard mixtures for parts that may be subjected to slight knocks or similar contacts. But for bar stock used for screw machines and similar work a softer coating is needed.

Whenever a bar is pulled out the rack it scrapes off some of the coating on those below it. This coating must be soft enough to flow and cover the bare part or it ceases to be a protection. Here again the chemist plays his part in the economies of production.

IDEAS FROM PRACTICAL MEN

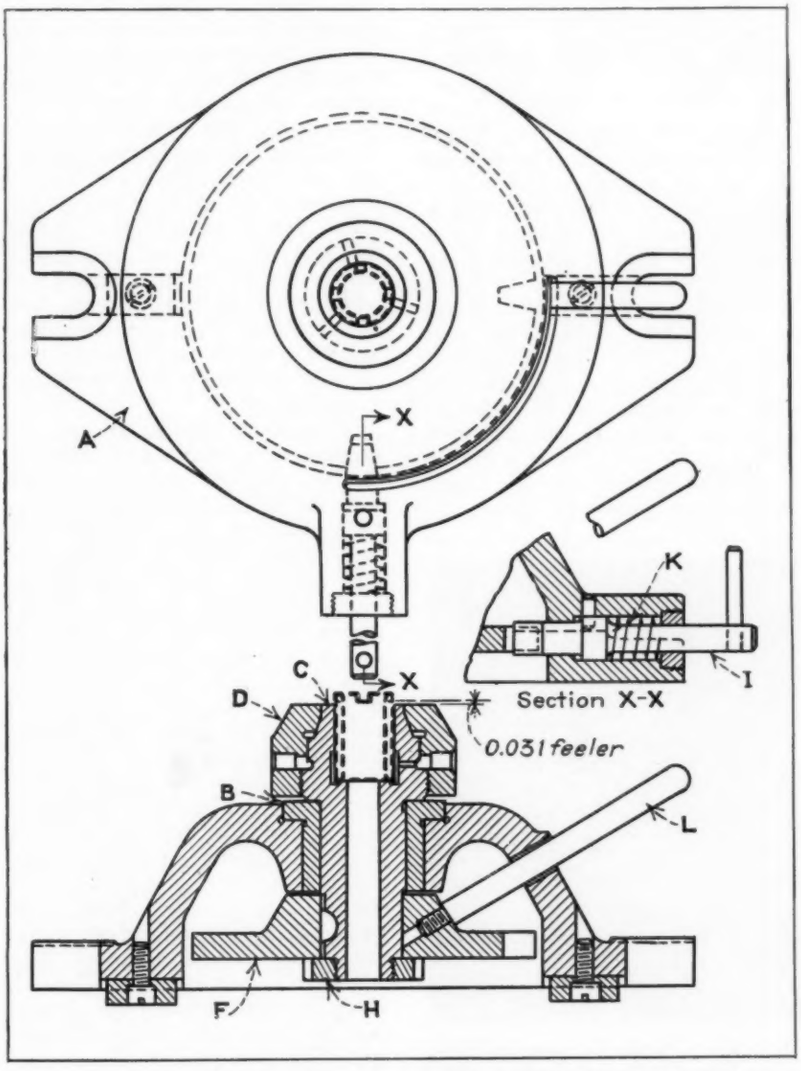
Index Milling Fixture

WILLIAM B. GREENER

An indexing fixture for milling two slots 0.187 in. wide and 0.125 in. deep at right angles to each other in the end of a bushing is shown in the illustration. The bushing, indicated by heavy dotted lines, must be held by the outside because the inside is lined with babbit that is lapped and highly polished to accurate dimension and would be injured if held on an expanding plug.

Essentially, the fixture consists of the cast-iron base *A* bored to receive the shouldered bushing *B* which is a drive fit; the collet *C* which is a slip fit in bushing *B;* the nut *D* for closing the collet; the index plate *F* which is attached to the collet by a woodruff key and the nut *H;* the index pin *I;* the spring *K* for holding the index pin in the notches of the index plate; the lever *L* for turning the collet in indexing; and the finger pin *M* for operating the index pin. Nut *D* is made so that it will lock on collet *C,* and thus prevent undue pressure on the work.

In the operation, with the work tightened in the collet making sure the index pin is in one of the notches of the index plate, the cutter is set for depth against the 0.031-in. feeler gage at the top of the collet. Then the first slot is milled. The index pin is withdrawn and the collet is rotated by lever *L* until the index pin snaps into the next notch in the index plate. The work is then in position for milling the second slot at right angles to the first.



The work is held by the outside in a spring collet and is indexed for milling two slots in the end at right angles to each other

Grinding Fixture for Steel Pawls

J. R. WHITTLES

For grinding the outer ends of hardened steel pawls, the fixture illustrated in Fig. 1 was made to be held between the centers of a cylindrical grinder. One of the pawls is shown in detail in the lower left-hand corner of the drawing. The sides of the pawls were ground in a previous operation in a rotary surface grinder.

The body *A* of the fixture has eight pins *B* and four milled slots *C*. The pawls are placed in the slots and are located by the pins engaging holes in their inner ends and by the lugs *D* which are formed by milling the slots. The fixture holds eight pawls arranged in four pairs, each pair being placed back to back. The lugs *D* fit between the backs of each pair and serve as stops.

The cap *F* has a stem *H* fitting a hole in the body and is threaded on the outer end for the tightening nut *I*. Four slots are milled in the cap, leaving four lugs at *K*, each lug contacting the sides of one pair of pawls and holding them securely when nut *I* is tightened.

In Fig. 2 is shown another fixture for the same purpose, but instead of being mounted on centers it is at-

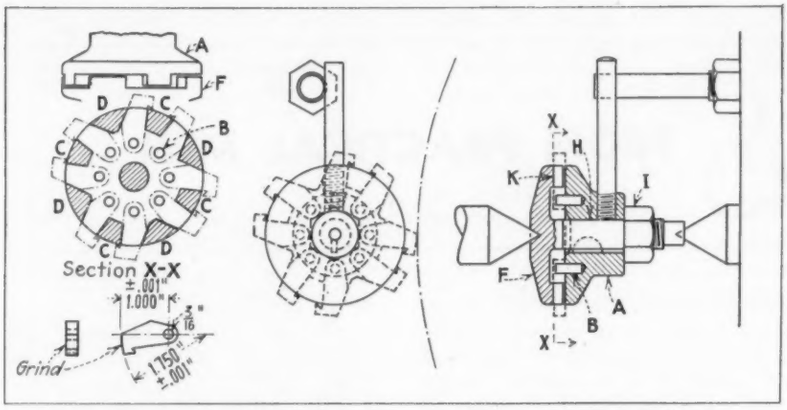


Fig. 1—The fixtures holds eight pawls arranged in four pairs placed back to back. Lugs fit between the backs of each pair and serve as stops

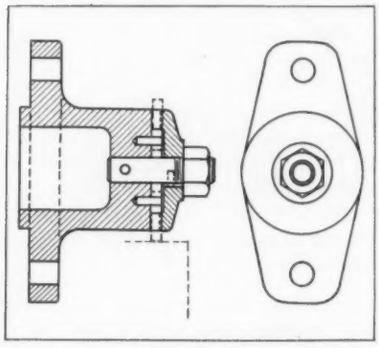


Fig. 2—An alternate design of fixture for the same purpose. Instead of being mounted on centers, it is attached to the faceplate and is centered by a pilot

tached to the faceplate. The tightening nut is screwed on the thread-end end of a stud pinned in a hole in the body, and bears on the cap. Other details are the same as in the fixture previously described.

Broaching With a File

C. A. MOWREY
DuMaurier Company

A short time ago we had a rush job of broaching several 3/16-in. square holes in brass stock 0.050 in. thick. We had no broach of the right size and there was not time to make one.

We found that a square file 5 in. long and having a long taper was 3/16 in. square at its largest part. After drilling holes of the correct size in the pieces, we pushed the file through them in an arbor press and the result was a highly satisfactory job at a minimum of time and expense. About half of the tang on the file was cut off to leave it strong enough for the file to be pushed through the work.

While a round file can be used for broaching round holes, it has a tendency to follow a helical movement. A square pilot or other means of preventing the file from turning might have to be used, as well as a fixture or other clamping device to prevent the work from shifting.

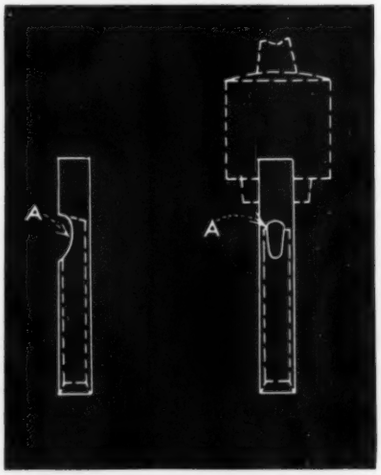
Tool for Drilling Rubber

GORDON W. RICHARDS

In the illustration is shown a tool for drilling rubber. It is made along the lines of a punch for punching holes in leather, but instead of being driven through the material by a hammer it is used in the drill press.

Such tools can be easily made from drill rod of the proper diameter. A hole of a diameter that will leave a very thin wall is drilled endwise in the rod, its depth depending upon the thickness of the rubber to be drilled. After the hole has been drilled in the rod, the very tip of the wall is thinned from the inside to knife-like sharpness. Then in the side near the end of the drilled hole, the opening *A* is filed to permit the rubber cores inside the tool to escape. The tool is then hardened and tempered and is ready for much hard use.

It has been found that tools of this kind are efficient and drill clean holes of the size of the rod from which they are made.



Made like a punch for punching holes in leather, this tool instead of being driven through the material by a hammer is used in the drill press

Lathe Centers Aligned by Eccentric Collar

J. H. GILL
College of Engineering
West Virginia University

The article by R. G. Hewitt under the above title (*AM*—Vol. 81, page 991) tempts me to describe the method we use at the West Virginia University for aligning lathe centers.

First see that the live center runs true. If not, it is useless to try to set the dead center in line with it. To test the live center, we take as a test piece any piece of metal having good centers and place it without a dog between the lathe centers. The piece is held from turning by the hand and the lathe is started. A tool in the toolpost is brought close to the live-center end of the test piece and if the live center does not run true it will be evident by the approach and receding of the test piece to and from the tool. If the live center does not run true, dirt in the spindle hole or nicks in the body of the center are looked for.

When the live center runs true the problem is to set the dead center so that the line of centers is parallel with the line of tool travel. We use as a test piece any piece that has good centers and is turned true on one end. This piece is placed between the lathe centers with the turned end on the live center. A tool in the toolpost is brought nearly into contact with the turned surface of the test piece and the space between it and the tool is tested with a piece of thin paper.

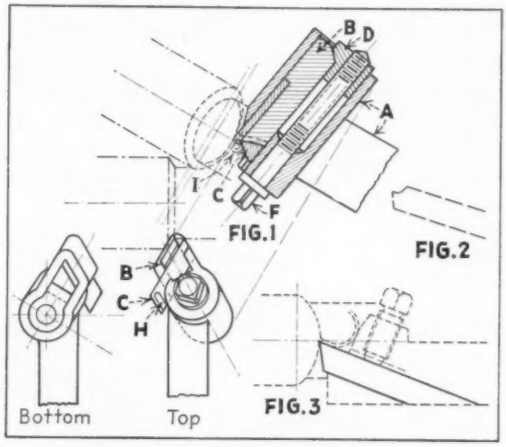
When the tool is adjusted so that we can feel the friction of the paper as it is drawn between the tool and the test piece, the test piece is taken out and the carriage is traversed so the tool is at the dead center, being careful that the setting of the cross-feed screw is not disturbed. The test piece is then turned end for end is again placed between the centers. The test is made at the dead-center end of the test piece with the same piece of paper between the tool and the test piece at the same spot on the

test piece as before. Then the tailstock is adjusted until the paper has the same "feel" as when the test was made at the live-center end. The centers are then certain to be in correct alignment.

Curling-Chip Toolholder

ALFRED M. WASBAUER
Malaunay, France

The toolholder here presented is an attempt at rationalization in the use of high-speed and carbide tipped tools. The assembly, Fig. 1, consists of the shank *A*; the toolbit *B*; the wedge *C*; the nut *D*; and the clamping screw *F*. The toolbit is clamped between the wedge, the nut and the walls of the holder.



Between workpieces of the same diameter the toolbit can be removed, ground and replaced and the correct diameter of the work will be maintained without adjustment

The toolbit can be taken out by removing the wedge from the left-hand side of the holder, a thumbnail groove being provided at *H* in the top view for that purpose. Removing the toolbit can be done without disturbing the position of the shank. When the toolbit is replaced after being ground it will be clamped in its original position and the diameter of the work will be maintained without adjustment of the cross-slide. If a number of ground bits are kept available, anyone of them can be used for replacement regardless of length. It will find the same center-height and maintain the same diameter of the work without cross-slide or toolholder adjustment.

If, however, the toolbit must be reground during the cut it is necessary to back out the toolblock slightly so that it can be removed and reinserted, but when the bit is in place and the graduated collar on the cross-feed screw is brought back to its original mark, the work can be turned to its original diameter without trial.

The toolbit must be ground on the top face only and always at the same angle. That means that it should be ground in a fixture or, if guided by hand in grinding, the angle should be maintained by using a protractor.

The principal function of the wedge *C* is chip formation. Toolbits are often ground as in Fig. 2 for the purpose of curling the chip into small diameter. If the toolbit is quite flat on top, as in Fig. 3, the chip will ribbon and snake and may cut the operator. Besides, removing and baling the chips will be more laborious. The wedge *C* will obviate all that and will curl the same form of chip with any bit having the same angle of top rake.

The diameter of the chip can be varied by changing the form or width of the wedge. Note the small diameter of the chip at *I* in Fig. 1. The toolbit in this instance is of irregular section to obtain the most compact form of holder, but the same principle of construction can be applied where a square toolbit is used, though it will give a more clumsy form to the holder.

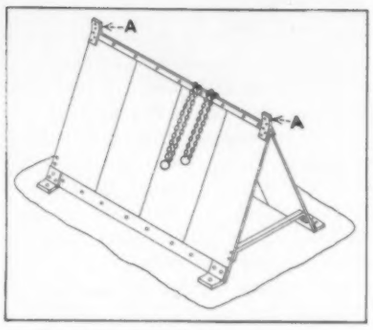
The clamping screw *F* should be of high-tensile steel since it must resist the entire tool pressure except what the slide absorbs in friction. The wedge should have a very hard surface to resist the abrasive action of the chip.

Convenient Storage Rack for Chain Slings

J. H. EASTHAM
Montreal, Canada

In many heavy assembly, machine and foundry departments, the aisles are often obstructed by chain slings temporarily out of use which may be the cause of accidents to passersby.

The illustration shows a light plate arrangement that makes an excellent storage rack for chain slings at low initial cost, reduces the accident hazard and keeps the aisles clear. It is 10 ft. long, 6 ft. high and has a 5 ft. spread at the base. The raised binder clips *A* add strength



Chain slings temporarily out of use can be conveniently stored on this rack, keeping the aisles clear and reducing the accident hazard to passersby

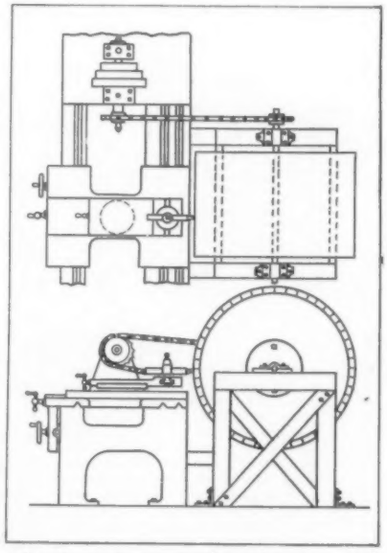
to the structure and prevent the slings from being pushed off endwise. The space underneath provides storage room for auxiliary crane equipment.

The rack is placed at the side of the crane runway next to the operator's platform where he can see what he is doing. He soon develops an uncanny facility for hanging the slings on or taking them off of the rack without any assistance. In taking off the slings, he nudges the chain hook into the desired position by butting its point lightly along the side of the rack before attempting to enter the hook into the ring of the sling.

Improvised Means for Turning Wooden Drums

BRUCE McINTOSH

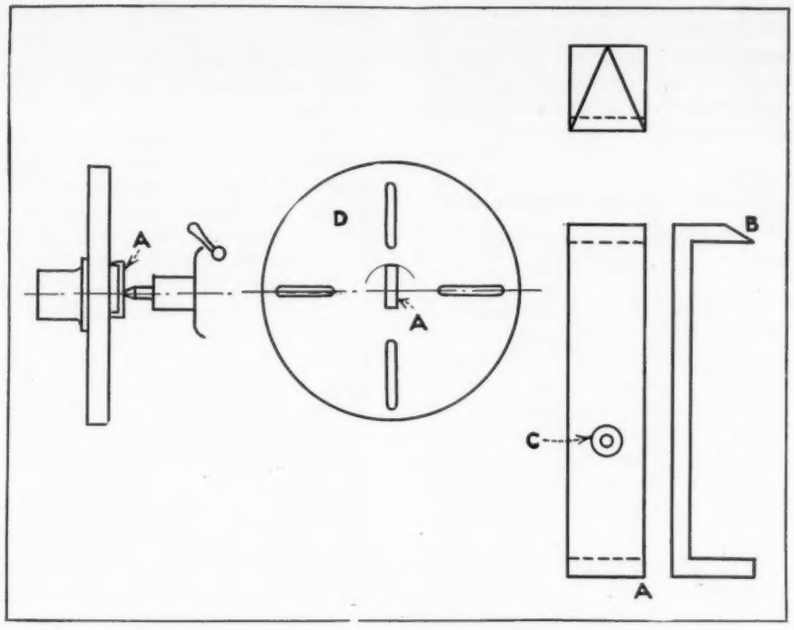
Occasionally we have to turn some large wooden drums, but the job does not recur often enough to



The drum is mounted on its own shaft in pillow blocks and is driven by a chain running over sprockets on the lathe spindle and the drum shaft

warrant the purchase of a wood-turning lathe of 3 ft. swing. Hence the outfit illustrated was built of heavy timber as a practical substitute and was secured to the floor at the back of an engine lathe, the toolpost assembly of which was secured at the rear end of the carriage cross-slide.

The drums are mounted on their own shafts in pillow blocks on the structure and are driven by a chain running over sprockets, one on the nose of the lathe spindle and the other on the end of the drum shaft. The center lines of the lathe spindle and the pillow blocks are, of course, as nearly parallel as possible. Depth of cut is obtained by adjusting the toolpost assembly by hand.



By manipulating the tool and the faceplate as described it can be determined whether or not the tailstock spindle is central with the lathe spindle

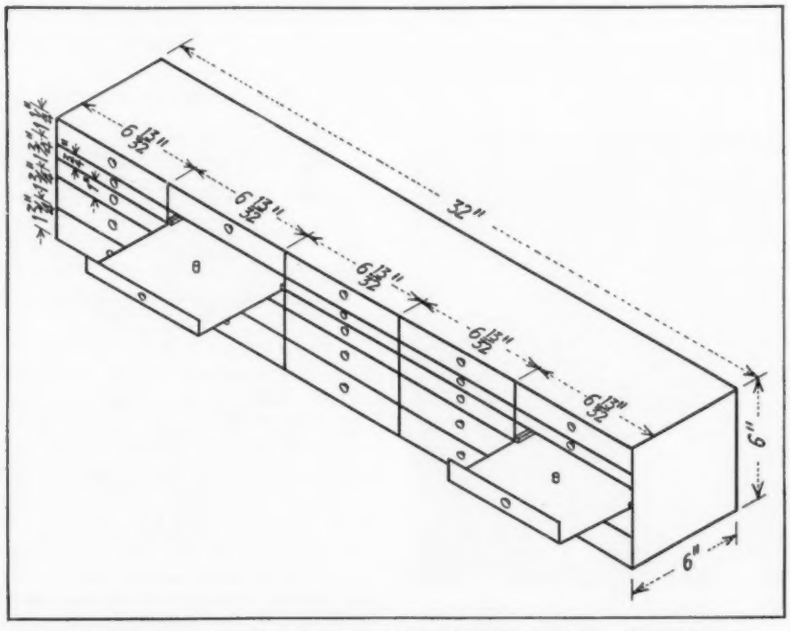
Grinding-Wheel Cabinet

C. F. FITZ

In our toolroom we have a universal tool and cutter grinder on which we do a wide range of work, and for which we require a large variety of grinding wheels of different sizes, shapes, grits and grades. To protect the wheels from injury, the cabinet illustrated was made of 20-gage black iron to the dimensions given. The drawers have wooden pegs projecting upward from their bottoms on which to "string" the wheels and keep them in place. They have brass knobs and slide between two pieces of $\frac{1}{4}$-in. key steel attached to the partitions.

On the fronts of the drawers are painted numbers corresponding to those on a chart that hangs beside the cabinet. The chart gives the grit, grain and size of wheels required to do certain jobs, and the numbers of the drawers in which they are to be found.

The cabinet fits into a larger one that holds all the attachments for the machine and is placed beside the grinder. It has saved us considerable in eliminating the breakage of wheels, as well as time lost in hunting for the wheel required.



The drawers are numbered and a chart gives the number of the drawer in which the wheel for a certain job is to be found

Center Finding Tool

H. MOORE

Leeds, England

For faceplate work where the tools are to be held either in the tailstock spindle or on its center, determining whether or not the tailstock spindle is central may be accomplished by manipulating the faceplate in connection with the tool illustrated.

The tool *A* is made from flat steel and is bent over at each end, one end being ground to a point, as at *B*. A center *C* is countersunk in the back near the heel.

In use, the faceplate is chalked near the center and the tool, with the tailstock center in the countersink, is brought up to touch it lightly. The tool is then rotated approximately half a turn, scribing an arc *D* on the chalked surface of the faceplate. Without disturbing the position of the tool, both it and the faceplate are revolved 180 deg.

If the tailstock spindle is central with the lathe spindle, the point of the tool will touch the arc previously scribed. If not, the amount it is out of center will be shown by rotating the tool and scribing another arc near the first one. To center the tailstock spindle, the tailstock is adjusted so that the point of the tool will be approximately midway between the two arcs. The process of scribing arcs and adjusting the tailstock is then repeated until both arcs coincide.

AMERICAN MACHINIST *Reference Book Sheet*

Welding Symbols—I

THE AMERICAN WELDING SOCIETY has recently published weld symbols for fusion and resistance welding to supercede the Society's former symbols as published in 1929 and revised in 1935. These symbols provide the means of placing complete welding information on drawings.

Location of symbols, numerical and other data on the reference line always has definite significance. This is shown in the accompanying illustration, in which the standard manner of placing information on the symbols is shown diagrammatically.

A new feature in this revision is the use of the tail of the reference line for referring to the welding specification reference to be used in the making of the weld. If a welding operator knows the size and type of weld, he has only part of the information necessary for the making of that weld. The process, type and make of filler metal that are to be used, whether or not peening or chipping are required, and other pertinent data must be known before he can start work. The specification to be placed in the tail of the ref-

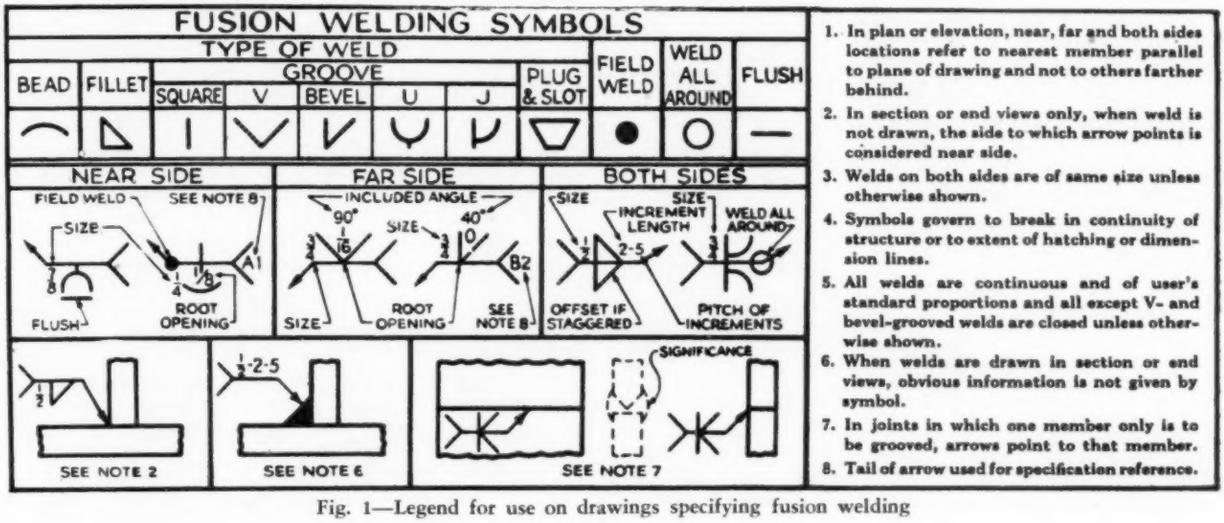
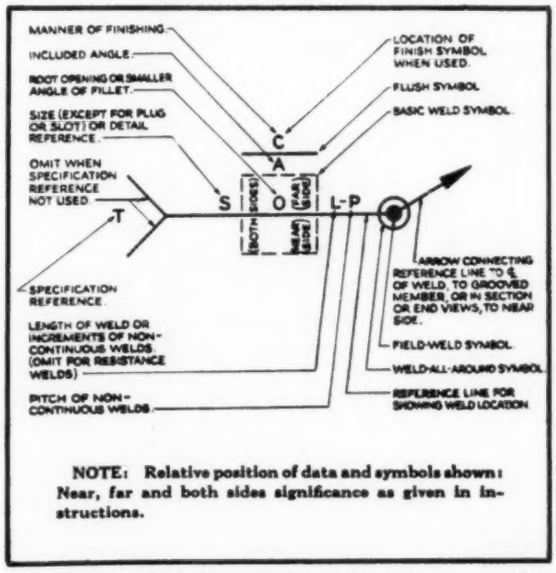
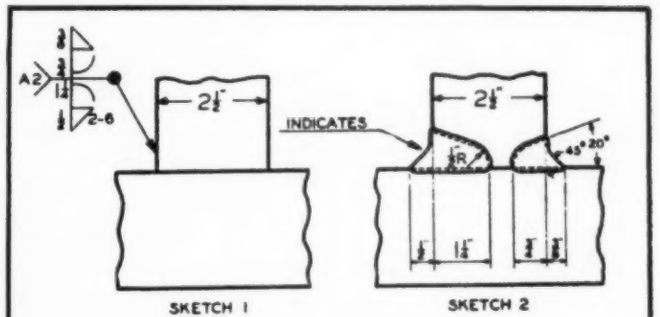

FUSION WELDING SYMBOLS
TYPE OF WELD
BEAD
FILLET
GROOVE
SQUARE
V
BEVEL
U
J
PLUG & SLOT
FIELD WELD
WELD ALL AROUND
FLUSH
NEAR SIDE
FAR SIDE
BOTH SIDES
FIELD WELD
SEE NOTE 8
SIZE
FLUSH
ROOT OPENING
INCLUDED ANGLE
90°
40°
SIZE
ROOT OPENING
SEE NOTE 8
SIZE
INCREMENT LENGTH
2-5
WELD ALL AROUND
OFFSET IF STAGGERED
PITCH OF INCREMENTS
SEE NOTE 2
SEE NOTE 6
SIGNIFICANCE
SEE NOTE 7
1. In plan or elevation, near, far and both sides locations refer to nearest member parallel to plane of drawing and not to others farther behind.
2. In section or end views only, when weld is not drawn, the side to which arrow points is considered near side.
3. Welds on both sides are of same size unless otherwise shown.
4. Symbols govern to break in continuity of structure or to extent of hatching or dimension lines.
5. All welds are continuous and of user's standard proportions and all except V- and bevel-grooved welds are closed unless otherwise shown.
6. When welds are drawn in section or end views, obvious information is not given by symbol.
7. In joints in which one member only is to be grooved, arrows point to that member.
8. Tail of arrow used for specification reference.

Fig. 1—Legend for use on drawings specifying fusion welding


MANNER OF FINISHING
INCLUDED ANGLE
ROOT OPENING OR SMALLER ANGLE OF FILLET
SIZE (EXCEPT FOR PLUG OR SLOT) OR DETAIL REFERENCE
OMIT WHEN SPECIFICATION REFERENCE NOT USED
T
SPECIFICATION REFERENCE
LENGTH OF WELD OR INCREMENTS OF NON-CONTINUOUS WELDS (OMIT FOR RESISTANCE WELDS)
PITCH OF NON-CONTINUOUS WELDS
LOCATION OF FINISH SYMBOL WHEN USED
FLUSH SYMBOL
BASIC WELD SYMBOL
C
A
S
O
L-P
BOTH SIDES
NEAR SIDE
FAR SIDE
ARROW CONNECTING REFERENCE LINE TO WELD, TO GROOVED MEMBER, OR IN SECTION OR END VIEWS, TO NEAR SIDE
FIELD-WELD SYMBOL
WELD-ALL-AROUND SYMBOL
REFERENCE LINE FOR SHOWING WELD LOCATION

NOTE: Relative position of data and symbols shown: Near, far and both sides significance as given in instructions.

Fig. 2—Standard location for information on welding symbols



INTERPRETATION OF SYMBOL:

Double-fillet-welded, partially-grooved, double-J, tee-joint with incomplete penetration. (Type of joint shown by drawing.) Grooves of standard proportions (which are, ½" R, 20° included angle, edges in contact before welding) ¾" deep on far side and 1¼" deep on near side. ⅛" continuous fillet weld on far side and ⅛" intermittent fillet weld on near side with increments 2" long, spaced 6" center-to-center. All fillets standard 45° fillets. All welding done in field in accordance with welding specification No. A2 (which requires that weld be made by manual D C shielded Metal-Arc Process using high grade, covered, mild steel electrode; that root be unchipped, and welds unpeened, but that joint be preheated before welding.)

Fig. 3—Comparison between symbolic and verbal methods of conveying welding information

AMERICAN MACHINIST *Reference Book Sheet*

Welding Symbols—I

erence line at present will be handled by each individual company which will set up its own requirements in any manner it sees fit. Later on a national standard may be prepared to co-ordinate the various specifications and processes in use.

The principal difference between the fusion and resistance welding symbols as revised is that the fusion welding symbols designate the size of the weld, whereas the resistance welding symbols call for the strength of the required weld. This difference is necessary because in spot, projection and seam welding, the weld is inaccessible.

Further instructions on how to use the welding symbols will be published in a forthcoming number.

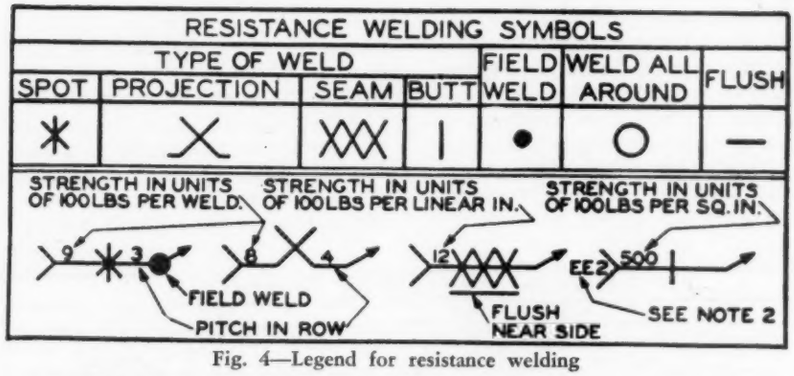


Fig. 4—Legend for resistance welding

1. Symbols govern to break in continuity of structure or to extent of dimension lines.
2. Tail of arrow used for specification reference.
3. Note that all dimensions are in inches.

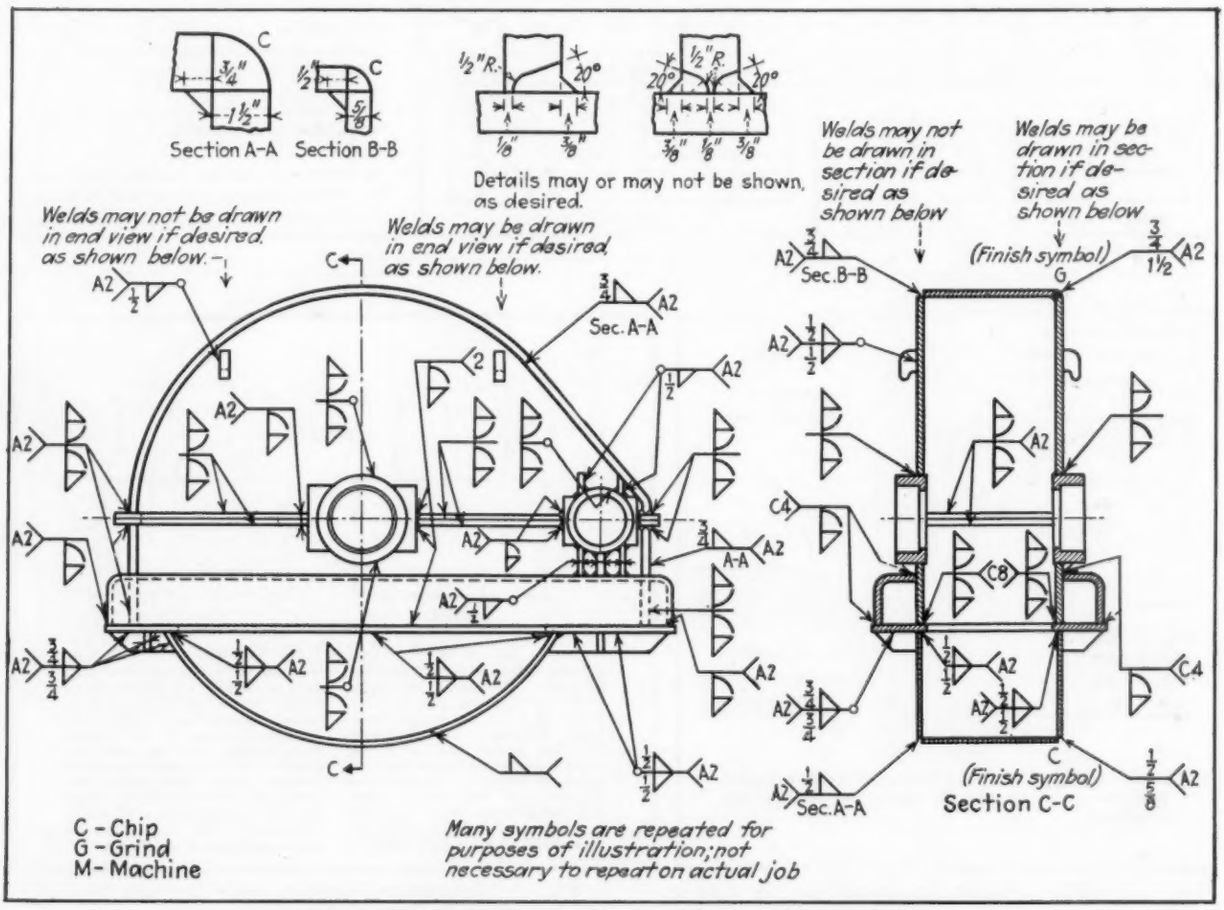

Section A-A
Section B-B
Details may or may not be shown, as desired.
Welds may not be drawn in end view if desired, as shown below.
Welds may be drawn in end view if desired, as shown below.
Welds may not be drawn in section if desired as shown below
Welds may be drawn in section if desired as shown below
Sec. A-A
Sec. B-B
(Finish symbol)
Section C-C
C - Chip
G - Grind
M - Machine
Many symbols are repeated for purposes of illustration; not necessary to repeat on actual job

Fig. 5—Typical drawing showing use of fusion welding symbols

INDUSTRIAL REVIEW

WITHOUT EXCEPTION reports from the leading industrial centers of the country say that orders for machinery are still declining. There are still many business men who expect considerable improvement after the first of the year but others are beginning to express the opinion that it may be a year before the level of recent months is again attained. Everyone has an eye on Congress hoping that steps will be taken to modify the laws that have brought business down to its present level.

IN NEW ENGLAND distributors report that the dullness in the textile machinery business is affecting machine tools as well and that customers have generally made up their minds not to go ahead until the Washington situation is cleared up. Very little is stirring in the New York territory where the persistent blue tinge of Wall Street is affecting other kinds of business. Philadelphia reports few inquiries and fewer orders and not much hope for improvement until the tax set-up is changed. Pittsburgh reports an occasional order for a small machine and continuing orders for repair parts, but not much else except continuing good inquiry for heavy equipment.

PESSIMISM is rather general in the Cleveland area. Almost everyone has experienced a drastic reduction in the volume of new orders and the result has been extensive lay-offs and reduction of hours for those retained. Orders in Detroit are few and far between and there are not many inquiries that promise to develop into orders before 1938. Nevertheless there is still faith that conditions will improve shortly and that there will be a considerable measure of recovery by this time next year. If it were not for foreign business some of the machine tool people in the Cincinnati area would be faced with the problem of shortening force.

ST. LOUIS is distinctly pessimistic about the immediate future but looks for better times farther ahead. Machine tool orders are at a low ebb and there is also a decided let-down in the small tool business. Chicago, which has been the bright spot in the industrial picture for several months, is beginning to feel the effect of the general recession. Inquiries and orders are both off in Milwaukee. Plants there report lay-offs of men and considerable doubt about the prospects for the next few months.

CONTINUING EXPANSION in Southern California, which industrially has been characterized by the mushroom growth of small manufacturing establishments, is the bright spot in the western business picture. Elsewhere along the Pacific Coast business leaders share the dismal national psychology.

CHIPS

Washington

Congress convenes, listens to a mild message from the President, runs away from its leaders . . . Senators offer amendments to preserve neutrality . . . Mayor's conference demands more money for relief . . . Maritime Board says loans should be made for flying boats which bid fair to take business from superliners . . . Roosevelt orders Federal Trade Commission to investigate living costs blaming monopolies, opponents smell another red herring . . . House defers drafting of tax relief measure until January 15 but sentiment grows for early action . . . Postal service takes unemployment census . . . Secretary Ickes supports formation of Conservation Department . . . House Rules Committee holds grimly to wage-hour bill defying efforts to dislodge it . . . Green opposes measure as Secretary Perkins urges its passing . . . Labor Department reports loss of jobs by 80,000 in October . . . President confers with utility leaders in effort to release big construction program.

Foreign

Chinese government officials and foreign ambassadors abandon Nanking as Japanese armies approach . . . Senator Beranger says Japan threatened attack on French Indo-China to stop shipments of munitions to China, defenses strengthened . . . Japan indicates that any aid to China from anyone is an unfriendly act and will be resented . . . Germany withdraws five consuls from Russia, by request . . . Quezon would like to have U. S. military protection for Philippines . . . Great Britain and U. S. reach agreement to negotiate reciprocal trade treaty . . . Rightist plot stirs France, weapons of German and Italian make seized by government agents . . . Brussels parley folds up . . . Japan demands all of China's rights in Shanghai as "customary spoils of a victor" . . . German army gradually taking over industry under 4-year plan . . . British trade at high level, large gains over 1936.

Finance

Christmas clubs to pay $320,000,000 less than last year . . . Szymczak of Federal Reserve Board hints that there will be no further moves to combat recession . . . Reserve presses campaign to speed up expansion of bank credit . . . Bond prices drop steadily.

Industry

Unauthorized sit-down strikes close several automobile plants for short intervals . . . Armco to build new coke ovens at Hamilton, Ohio—cost $500,000 . . . Minneapolis teamster union leader ambushed and killed, others threatened . . . Rand and Bergoff acquitted of strike breaking charge at Middletown trial . . . National Grange attacks wage-and-hour bill as ruinous to farmers . . . Martin first defends Fisher Body sit-downers then condemns them and denies them support of national union, Governor Murphy threatens troop call and Martin gets strikers to come out . . . Goodyear strikers come out of Akron plant as Governor Davey orders militia to stand by . . . C.I.O. plans drive in Jersey City in defiance of Mayor Hague.

Indicators

Steel production in sharpest drop on record, now down to 30 . . . Electric power output drops to 1936 level . . . Business Week's index off a point to 64.5 . . . Metal trades employment off 0.8 per cent in Oct. according to N.M.T.A. barometer.

DETROIT LETTER

Union Leftists Propose Guerilla Warfare Against G.M. As Governor Murphy Condemns Sitdowns . . . Car Makers Give Releases On Week-To-Week Basis . . . Die Trouble Delays Ford Output . . . Big Die Program for '39

DETROIT—Labor turmoil has overshadowed business recession as the chief problem confronting the motor industry. The automotive map is dotted with strikes and threatened strikes. The more radical element in the United Automobile Workers has gone so far as to advocate a policy of guerilla warfare in an attempt to exact from General Motors a more favorable union agreement. Such warfare would take the form of a series of strikes in key departments and key plants, following rapidly one upon the other, thus demoralizing the corporation's production operations.

The strike virus has spread widely throughout the industry. There have been strikes at Fisher Body in Pontiac, at Cadillac, at Hudson, at the Wilcox-Rich Division of Eaton Mfg. Co. at Saginaw, at the Highland Park plant of Briggs Mfg. Co., at Bundy Tubing and at the St. Louis assembly plant of the Ford Motor Co. Buick narrowly averted a strike the past week. The labor situation is said to be far from "sweet" in Chrysler, particularly in Plymouth, where clashes have occurred between members of an employees' association and U.A.W. workers.

That the U.A.W. has picked a bad time to stir up trouble is generally conceded. Even labor-minded Governor Frank Murphy of Michigan went on record last week with an unusually courageous and vigorous statement regarding the present tendency of the U.A.W. to harass management. Said the Governor, "With business conditions causing concern, and with facilities provided for peaceful settlement of disputes, there is no adequate excuse for taking violent or extreme measures to redress minor grievances. While the rights of workers must be respected and guaranteed, business men must have freedom of management and assurance that they can operate without frequent and unwarranted interruptions. The proper way to settle grievances is not to suspend the authority of law by taking possession of a shop or factory." The Governor went on to say that "what we need right now is stability in employment and business. The worker needs this as much as the employer does."

It is believed that recent strikes are surface indications of the deep rift in the U.A.W. ranks, a rift which the Milwaukee convention of a few months ago unsuccessfully attempted to close. There is little doubt that the more conservative union leaders did not want strikes at this time. They were aware of the fact that the union is not in so strong a position as a year ago. With dealers well stocked, car sales slowing down and dealers eager to cut inventories, Homer Martin knew that factories did not care whether they stayed open or not.

Though the Martin regime still is in national control of the U.A.W., certain local leaders appear to be incorrigible. They advocate a "war-at-any-price" policy. Last year when the union was busy organizing General Motors and Chrysler and needed strikes to secure members, these local leaders were welcomed with open arms. Today they have outlived their usefulness, but have so entrenched themselves that the Martin administration doesn't know how to get rid of them.

The Pontiac Fisher strike, where 400 men caused a layoff of thousands, is a case in point. If anything, the strikers were more bitter toward union headquarters than toward General Motors. To them the declaration by Martin that the instigators of wildcat strikes would no longer be disciplined was an invitation to start something so they proceeded to try to capitalize on the situation. Martin woke up to what was going on when the situation was out of control. It took representatives of all G.M. locals from all over the United States, assembled by Martin in Flint, hours of argument and threatening to induce the strikers to leave the plant. Even so Martin had to promise that he would insist upon the rehiring of the wildcat strike leaders.

General Motors and the U.A.W. are dealocked now over the former's demand that a clause be written into

Machine-Tool Men Visit Buick—**Heald executives and sales engineers visited Buick's new automatic transmission plant as the climax of their sales convention. Left to right—Robert Heald, boring division manager, Heald Machine Co., Fred Pyper, Buick master mechanic, S. D. Massey, Heald's vice-president and sale manager, R. M. Lippard, Detroit manager, J. G. Hammond, Buick, and Roger Heald, president of Heald Machine Co.**

the union contract guaranteeing the right of the corporation to discharge men participating in unauthorized strikes and pledging the union to discipline these men. The union is insisting that if this clause be adopted, the corporation pledge itself to discipline foremen who incite employees to rebel. Union leaders have maintained for some time that plant managers and lesser officials have been trying to undermine the union by goading the rank and file of unionists to strike.

With labor in such a turmoil, it is no wonder that car makers are not willing to commit themselves to planning ahead production-wise more than 30 days. Steel and other raw materials purchases will continue on a hand-to-mouth basis until the labor clouds lift and also until some idea can be obtained as to potential business for 1938. The same caution prevails in releases for parts.

Ford's slowness in getting into production has been partially responsible for the low level of steel demand. While Ford output is expanding, it is far from normal. As a matter of record, Ford did not officially announce its '38 cars until this week. Cars displayed at New York during show week were hand-built. From a dealer standpoint the Ford delay has not been serious, as clean-ups of 1937 models took longer than expected. Part of the production delay, however, has been due to trouble with dies on sheet metal parts which had been changed from '37 cars.

No releases have been issued by Ford on the new tooling program to increase capacity at the Rouge plant. This, incidentally, is the only machine tool business of importance at the moment. Equipment builders are busy delivering machinery to the new General Motor diesel plant at Detroit, to the new Chevrolet factory at Tonawanda and to the Canadian Chrysler plant.

Thirty days ago it appeared that releases for 1939 tools and dies would come through as early as December. This is now unlikely, though an early start on 1939 programs is expected. If current indications are a criterion, 1939 models will be radically altered in appearance, involving a heavy body die program for next spring and summer.

Several car makers are studying the possibilities of lower car prices, but there is a hesitancy about going ahead. It is believed that a reduction in prices of new cars would tend to upset the stability of the used car market.

S. A. E. Production Meeting in Flint, Dec. 8-10

Five technical sessions and two plant visits are scheduled for the three-day meeting of the production engineering division of the Society of Automotive Engineers, in Flint, Dec. 8-10. The American Welding Society, Detroit Section, is cooperating with the S.A.E. during the electric welding session, Dec. 8. The program follows:

December 8

9:30 a. m.
Registration

2:00 p. m.
Pistons and forgings
Chairman—Leroy Cram
"Casting and Machining of Ford Cast Steel Pistons"—W. F. Pioch, Ford Motor Co.
"Precision Forging Practice"—L. A. Danse, Cadillac Motor Car Co.

8:00 p. m.
Electric welding
Chairman: F. W. Cederleaf, Soc. of Auto. Engrs.; Vaughan Reid, Amer. Welding Soc.
"The Fundamentals of Welding"—C. A. Adams, The Edw. G. Budd Mfg. Co.
"Recent Developments in Resistance Welding"—J. S. Williams, P. R. Mallory Co.

December 9

9:00 a. m.
Fisher Body Plant No. 1—(Buick)

2:00 p. m.
Finishing and planning
Chairman—V. P. Rumely
"The Finishing of Automotive Parts With Synthetic Resin Enamels"—J. L. McCloud, Ford Motor Co.
"Purchasing, Planning and Scheduling Parts for Building Multiple Model Automobiles"—D. A. Wallace, Chrysler Corp.

8:00 p. m.
Machining Problems
Chairman—W. H. McCoy
"Do We Understand the Grinding Process?"—R. V. Hutchinson, Olds Motor Works.
"Peculiar Machining Problems of Automatic Transmissions"—F. C. Pyper, Buick Motor Co.

December 10

9:00 a. m.
Buick plant No. 66

2:00 p. m.
Gears and splines
Chairman—Jos. Geschelin
"Recent Developments in Spline and Gear Cutting and Finishing"—R. B. Haynes, Spicer Mfg. Corp.

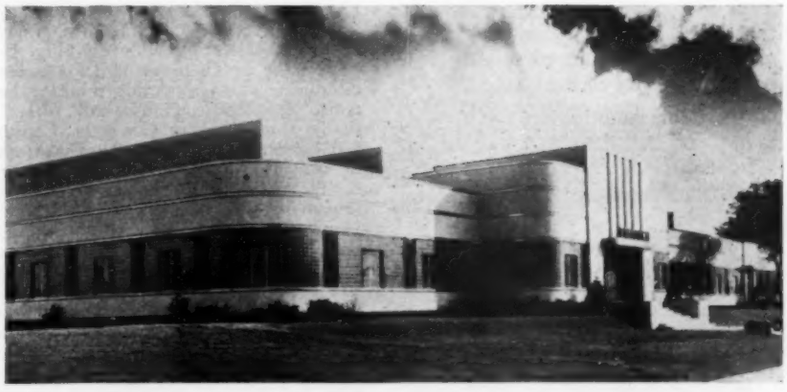
ARNOLD LENZ

"The Economical Mass Production of Accurate Gears"—C. H. Stanard, Buick Motor Co.

6:30 p. m.
S. A. E. Production Dinner
Dinner Chairman—C. A. Chayne, Buick Motor Co.
Toastmaster—Michael A. Gorman, editor, Flint Journal.
Speaker—Arnold Lenz, assistant manufacturing manager, Chevrolet Motor Co.

Japan to Expand Railway Equipment

A building program amounting to 100,000,000 yen for the 1937-38 fiscal year has been announced by the Japanese Railway Ministry, according to reports published in Tokio. The program includes construction of 500 locomotives, 7,000 freight and 200 passenger cars. Negotiations for iron supplies needed in the program are now under way with the Japan Iron Manufacturing Co., pending the arrival of lathes and machinery from abroad.



Armco's $280,000 Research Building—9,000 persons accepted American Rolling Mill Company's invitation to visit "House That Research Built," were amazed at work undertaken in applying iron and steel sheets to industrial and consumer goods. The "Open House" plan is used at all of Armco's plants with increasing success

WATCHING WASHINGTON

Congress takes bit in its teeth in effort to aid business . . . Original special-session program upset . . . Carlisle promises large utility outlay . . . Wage-hour bill hampered by labor criticism

WASHINGTON — The slim olive branch offered by the President to business in his message to Congress may bear fruit beyond the plans of the Chief Executive. Fertilized by congressmen, anxious to keep industry blooming during a campaign year, the tax relief and freedom from restrictions which business insists upon is likely to flourish.

Apparently the Administration has discarded its first purpose of attempting to defer tax legislation until the regular session. A strong congressional group was responsible for this change of heart. Senator Walter F. George, of Georgia, for instance, member of the Finance Committee and powerful figure among the group of southern conservatives who hope to take the party away from the New Dealers and nominate one of their own members in 1940, wants immediate revision both of the capital gains and of the undistributed earnings taxes. Not only that, he wants to make the modification retroactive to apply to 1937 earnings. House Republicans have united for outright repeal of the earnings tax. Not going quite so far, the Ways and Means Committee's tax subcommittee approved complete revision of the Corporate tax structure, retaining only the principle of the levy. The committee's action, which constituted a major concession to the pressure for revision or repeal, was based on the following changes:

Corporations having net annual incomes less than $25,000 would be entirely exempt from the undistributed profits tax, paying only 12½ per cent up on income to the first $5,000 and 14 per cent on the next $20,000.

Corporations having net annual incomes of more than $25,000 would be taxed according to the amount of income not distributed in dividends and would range from a minimum of 16 per cent to a maximum of 20 per cent, depending on this amount.

The President wants to use the modification of the earnings tax as another club against bigness. He says flatly that the tax could be changed by granting exemption to small companies so as to equalize the competition between them and the big ones. Actually his own Treasury Department has proved to its own satisfaction that the undistributed earning tax did not bear so heavily on small corporations as on the large ones. Most of the suggestions as to why the business recession had come was aimed at big business concerns rather than small ones.

Some shrewd observers do not believe the President will insist on the text of his first message. They think it was purposely put in general terms. Even his flat declaration against speculative profits—an old dogma of the New Deal doctrine—was not specific. On this point Congress is determined to permit the spreading of losses over at least two, if not three years, in opposition to the New Deal theory that saving for a rainy day merely makes it rain harder. So that altogether there are brewing all the ingredients of another spectacular battle between the White House and Capitol Hill—unless those observers are right who think the President is merely saving his face and will accept whatever congress may choose to hand him in the way of tax revisions.

A tangible plan for bolstering business by the expenditure of $112,000,000 in two years was made by Floyd L. Carlisle, head of the Consolidated Edison and Niagara Hudson Group of power companies, after an extended conference with the President. This announcement reflected a more satisfactory outcome than the conference on the previous day between the President and Wendell Willkie, president of the Commonwealth and Southern Corporation. The President's first strategy seemed to be an attempt to argue the utilities out of their fear of government policies without conceding anything on his basic power program. On the day of Mr. Willkie's visit he dispatched to various congressional committees and federal agencies a report by the New York State Power authority directed against friends of private utilities for "propaganda" against public power development.

Wage-Hour Bill Stalled

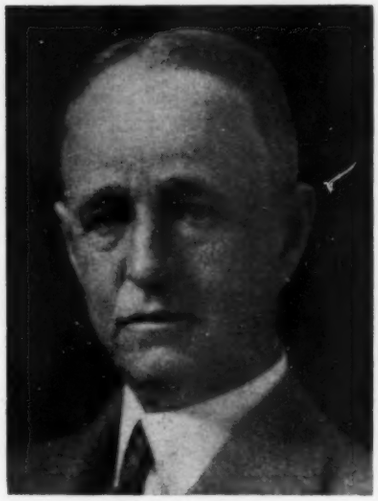
While the threatened depression in industry has directed activities of the special session into channels not originally planned, some of the items designed for attention have met serious snags. At this writing, the wage-hour bill is stalled in the Rules Committee, with only 180 of 218 needed names signed to a petition which would force the measure to the floor. Opposition to wages-hour legislation apparently fears not the several alternative measures now current, but the Black-Connery Bill passed by the Senate last session which House Labor Committee Chairman Norton is trying to take away from the Rules Committee to dismiss it. Even if Mrs. Norton wins, it will take so long that nothing could be done in the special session.

Wages-hour legislation now seems to depend upon the will of three groups: organized labor, the farmers, and the Administration.

TEMPERED TAXES

Tremendous impetus to replacements, installation of new tools and machinery, perhaps even actual plant expansion, though this last is dead against New Deal planning, should result from modifications of the tax bill. President Roosevelt will prevent modification of the tax on undistributed earnings for large corporations if he possibly can, and also deductions for anything involving an increase of plant "capacity", as distinguished from replacement, so these two phases must be considered in doubt. But both ends of Pennsylvania Avenue seem to be in accord on replacements and, less important, on exempting debt payments from this tax.

Doubt exists about everything beyond these two because of a fundamental difference in economic thinking between the White House and what is easily a majority in Congress. Capitol Hill wants to lift the load on business, or rather adjust it so it can be more easily be borne, all in the interest of improving employment. The White House and its economic, as distinguished from political, friends want to keep on the road leading to economic and social reform, which leads straight to planned economy. Actually, the President is just as worried over the business situation as has been represented, but he has not come anywhere near the point of surrendering his objectives, despite a deluge of Washington comment to that effect.—CARTER FIELD, *Washington Bureau, McGraw-Hill Publishing Co.*



E. P. BULLARD

E. P. Bullard to Be Honored by A.S.M.E.

"For outstanding leadership in the development of station-type machine tools", E. P. Bullard, president of the Bullard Co., will receive the A.S.M.E. Medal. It will be presented on Honors Night, Dec. 7 during the annual meeting of the American Society of Mechanical Engineers.

This development includes both the designing of machines that have played a very important part in the development of the automotive and similar industries, but also in solving the many problems that are involved in successful manufacturing. He has always been keenly interested in apprentice training and in maintaining the most cordial relations with his men regardless of their position.

Charles R. Hook Heads N.A.M. Committee

Charles R. Hook, president of the American Rolling Mill Co., has been made chairman of the resolutions committee of the annual Congress of American Industry to be held Dec 5-9 at the Waldorf-Astoria Hotel, New York, under the auspices of the National Association of Manufacturers.

Assisting Mr. Hook in the formulation of the industrial view point for presentation to the thousand or more manufacturers who will attend the meeting will be Elon. H. Hooker, president of the Hooker Electroche Chemical Co., who will be vice-chairman.

Among outstanding leaders who will assist Mr. Hook as members of the resolutions committee are the following men well known in the metal-working industry: Howard Coonley, chairman of the board, Walworth Co., Inc.; F. N. Bard, president, Barco Manufacturing Co,; William L. Batt, president, SKF Industries, Inc.; James W. Hook, president, Geometric Tool Co.; F. C. Crawford, president, Thompson Products, Inc.; F. F. Barnes, president, Associated Spring Corp.; Howard E. Blood, executive vice-president Borg-Warner Corp.; C. R. Sheaffer, vice-president and treasurer, W. A. Shaeffer Pen Co.; Philip C. Wentworth, treasurer, National Ring Traveler Co.; Howard Dingle, president, Cleveland Worm & Gear Co.; Graham H. Anthony, president, Veeder-Root, Inc.; George P. Torrence, vice-president, Rayon Machinery Corp.; R. C. Kuldell, president, Hughes Tool Co.; J. S. Sprott, president, Globe-Wernicke Co.; Hiland B. Batcheller, president Ludlum Steel Co.; William R. Webster, chairman, Bridgeport Brass Co.; and E. I. Garrett, president Wire Rope Manufacturing & Equipment Co.

Motor Manufacturers Elect New Board of Directors

The Motor & Equipment Manufacturers Association has announced election of the following as members of its Board of Directors for the three-year term, 1938-1940: D. S. Brisbin, vice-president, Columbus-McKinnon Chain Corp.; R. C. Brower, secretary-treasurer, The Timken Roller Bearing Co., and R. D. Pippen, assistant treasurer, American Hammered Piston Ring Division, Koppers Co., and F. W. Swanson, president, Globe Hoist Co.

Stainless Steel Exhibit Opens at Radio City

Every aspect of stainless steel—its history, developmnt, production, fabrication, and uses—is portrayed in a comprehensive educational exhibit at the New York Museum of Science and Industry. RCA Building, Rockefeller Center, N.Y. This exhibit which is sponsored jointly by the Electro Metallurgical Company, unit of Union Carbide & Carbon Corporation, and the Museum, is open every day from 10 A.M. to 10 P.M. The display includes hundreds of stainless steel products sent to the exhibit by manufacturers from all parts of the United States. The displays are supplemented by motion pictures and demonstrations and the superiority of the material for various kinds of service is shown by working tests. It is understood that the exhibit will be open for several months and then be transferred to other key cities.

Commercial Laboratories Form Association

Twenty of the principal commercial laboratories have completed organization of the American Council of Commercial Laboratories with the purpose of "promotion of scientific analysis, testing, inspection or research and advancement of the welfare of independent scientific laboratories." The Council states that its members will be carefully selected to include only or-

Kaiden-Keystone Studios

PRESTON S. MILLAR

ganizations in which producers, retailers and consumers may look for unbiased determinations of quality.

The following officers and members of an executive committee were elected: President, Preston S. Millar of the Electrical Testing Laboratories, New York; vice-president, Monroe L. Patzig, of Patzig Testing Laboratories, Des Moines; secretary, D. E. Douty, United States Testing Company, Hoboken, N. J.; treasurer, A. R. Ellis, Pittsburgh Testing Laboratory, Pittsburgh; Members of the Executive Committee—James H. Herron, The James H. Herron Co., Cleveland; F. B. Porter of Southwestern Laboratories,, Fort Worth, and T. A. Wright of Lucius Pitkin, Inc., New York.

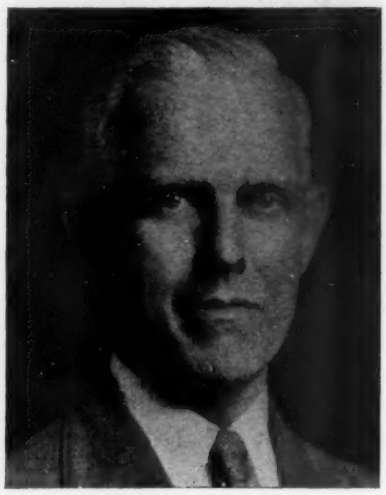
E. H. Smith Elected by Acetylene Association

Progress of the oxy-acetylene industry in meeting the demands of industry for improved technique, particularly during the last year, was the principal theme of the 38th Annual Convention, International Acetylene Association, Nov. 10-12. Three technical sessions and several plant visits were arranged for the 875 persons attending the convention.

J. L. Perry, president of the Tennessee Coal, Iron & Railroad Co., and also the new president of the Carnegie-Illinois Steel Co., welcomed the members and guests to Birmingham. He showed how the industrial region is vitally concerned with welding and was followed by Dr. James Shelby Thomas, president of the Chrysler Institute of Engineering. Dr. Thomas spoke on "New Frontiers for Smart People" advocating that men be unfettered by stilted rules or regulations and that they should be left free to work and act.

The president's address was made by C. D'W. Gibson, vice-president of the Air Reduction Co., Inc. Mr. Gibson pointed out that calcium carbide was discovered not very far from Birmingham and that acetylene which is made from this substance is being rapidly adopted by the chemical industry for the production of acetic acid. It is expected that within the next decade the chemical use of acetylene will far exceed its industrial use.

ELMER H. SMITH



J. L. PERRY

James Turner Morehead medal for 1936 was awarded to H. Sidney Smith, consulting engineer of Prest-O-Lite Company, Inc. Mr. Smith was also awarded the Samuel Wylie Miller medal of the American Welding Society and he has been president of the I.A.A. and the British Acetylene Association. Presentation of the Morehead medal was made by C. O. Epperson, vice-president of the National Cylinder Gas Co.

New officers of the I.A.A. are: Elmer H. Smith, president of the Commercial Gas Co., Minneapolis; vice-president, H. P. Dolisie, managing director, Canadian Liquid Air Co. Ltd., Montreal; secretary, H. F. Reinhard, engineer, Union Carbide Co., New York and treasurer, Henry Booth, sales manager, Shawinigan Products Corp., New York.

New directors are C. D'W. Gibson, vice-president, Air Reduction Company and retiring president of the association; L. F. Loutrel, vice-president, Shawinigan Products Corp., E. A. Doyle, Linde Air Products Co., and A. E. Faulhaber, vice-president, Compressed Industrial Gases, Inc.

Total registrations for the technical sessions were over 3,000. The meeting comprised three sessions at which more than 15 papers were presented.

H. Sidney Smith, left, receiving the James Turner Morehead Medal from C. O. Epperson, while C. D'W. Gibson, right, the retiring president, looks on

PERSONALS

HARRY M. WHITTAKER, formerly chief engineer of the Micromatic Hone Corp., has been appointed vice-president and director of sales. This appointment is part of the expansion of the executive personnel of Micromatic since purchase of the Hutto Machine Division of the Carborundum Co. jointly with the Barnes Drill Co. J. E. KLINE, formerly chief engineer of the Hutto Tool Division, becomes chief engineer in the combined organization. Other executive personnel appointments are: A. J. PRENTICE, secretary-treasurer; A. BLEASDALE, factory manager; N. H. HUBBARD, sales manager, tool division; E. L. GRUENBERG, sales manager, equipment division; H. L. HARWELL, sales manager, abrasives division.

Directors of the corporation are K. W. CONNOR, also president, A. J. PRENTICE, A. BLEASDALE, HUBERT E. HARTMAN and HERBERT J. WOODALL.

H. E. LONG, formerly vice-president of purchasing for Nash Motors, has been appointed director of purchases for all divisions of the Nash-Kelvinator Corp., according to an announcement made by GEORGE W. MASON, president. Mr. Long has established a central purchasing office at the Kelvinator factory, Plymouth Road, Detroit. B. T. WATKINS will serve as purchasing agent for Kelvinator and Leonard Divisions, and E. H. CLAUSON as purchasing agent for the Nash Motors Division.

HAROLD L. HOEFMAN has been appointed manager of the Link-Belt plant, warehouse and sales office at Atlanta, Ga. to succeed I. H. BARBEE, who died November 4.

HAROLD T. HULETT has been advanced from assistant manager to manager of the commercial refrigeration section, specialty appliance sales division, General Electric Co., Cleveland.

PHIL HUBER, formerly vice-president and assistant general manager of the Ex-Cell-O Corp., Detroit, has been elected president and general manager, succeeding N. A. Woodworth who has resigned because of ill health.

R. A. PETERSON has been appointed superintendent of the merchant bar mills, Gary works, Carnegie-Illinois Steel Corp. C. S. RAMSEY succeeds Mr. Peterson as assistant superintendent.

JOHN F. MILLER has been made chairman of the Pittsburgh Screw & Bolt Corp. to succeed the late WILLIAM G. COSTIN. Mr. Miller has been vice-chairman of the board and is also vice-chairman of the Westinghouse Air Brake Co.

KENNETH H. CONDIT, editor *American Machinist*, and one of the three A.S.M.E. representatives on the United Engineering Trustees, has been elected to fill the unexpired term of D. ROBERT YARNALL, president, Yarnall-Waring Co., as trustee member of the board of Engineering Foundation. As president of United Engineering Trustees, Mr. Yarnall is ex-officio a member of the Engineering Foundation Board.

L. W. WALLACE, formerly executive secretary of American Engineering Council, and more recently director of research for the Association of American Railroads, has become director of engineering and research of the Crane Co., Chicago.

OBITUARIES

H. E. Coffin Dies From Bullet Wound

Howard E. Coffin, industrialist and former automobile manufacturer, died of an accidental gun shot on Nov. 21 at Brunswick, Ga. Mr. Coffin, who was 64, arose to eminence in three major American industries. He was the founder of the Hudson Motor Car Co., was responsible for the development of the Liberty motor, was founder and first president of National Air Transport, Inc., and since 1932 was one of the principal textile men in the South.

In 1897 Mr. Coffin built his first gasoline-powered car and in 1898 one of the first steam-driven motor cars. He joined the Olds Motor Works in 1902 and became chief engineer in 1905. In the following year he assisted in launching the E. R. Chalmers-Detroit Co., which later became the Chalmers-Detroit Co. In 1909 the Hudson Motor Car Co. was formed and Mr. Coffin held the position of vice-president and consulting engineer.

HOWARD E. COFFIN

By the time the World War broke out Mr. Coffin was known as an expert on engines and motors and he had been president of the Society of Automotive Engineers in 1910. In the spring of 1915 President Wilson named him chairman of the Committee on Industrial Relations. With the officials of the five great engineering societies he made a rapid census of the industrial resources of the nation which might be drafted in case of war. Mr. Coffin was chosen to head the aircraft production board and he called in the nation's best engine designers for the work of planning the Liberty motor.

After the war Mr. Coffin became one of the founders and first presidents of National Air Transport, Inc. and finally chairman of the board. Then he began extensive real estate operations in Georgia. These ventures led him into the textile field where he became one of the founders of Southastern Cottons, Inc. At the time of his death he was chairman of the board.

I. H. BARBEE, manager of the Atlanta, Ga. plant, Link-Belt Co., died November 4. He had served Link-Belt for about 25 years.

THOMAS G. LAMANNA, district sales manager for the Gisholt Machine Co., Madison, Wis., with headquarters at Indianapolis, was killed November 8 when a train struck his automobile. Mr. LaManna had been associated with Gisholt since 1928 as sales representative, first in St. Louis and later in Chicago and, during 1937, in Indianapolis.

DONALD C. PECK, president of the Peck Spring Co., Plainville, Conn., died November 9. He is survived by a son, P. LESTER PECK, secretary, treasurer and general manager.

JOHN H. CONNOR, senior vice president of the United Shoe Machinery Corp., died November 22 in Paris.

ERNEST J. POOLE, vice-president and general manager of the Carpenter Steel Co., died November 16. Mr. Poole, who was 64, was chairman of the Pennsylvania State Chamber of Commerce and had led fights against various tax plans of the Earle administration.

EDWARD N. BOICE, treasurer of the Hanson-Van Winkle-Munning Co., Matawan, N. J., plating supplies manufacturer, died November 6. He was very active in the old Metal Finishers Equipment Association for a number of years.

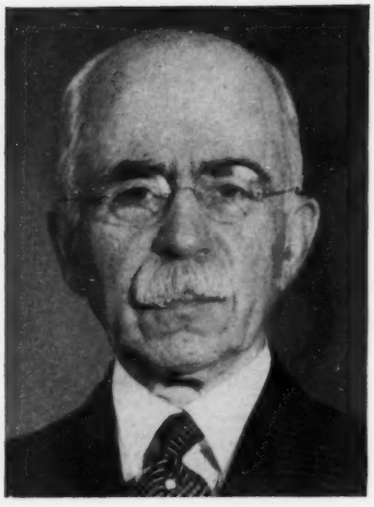
OSCAR E. ANDERSON, 57, president and general manager of the Jamestown Metal Corp., Jamestown, N. Y., died November 18 following a heart attack. He was formerly vice-president, treasurer and general manager of the Dahlstrom Metallic Door Co.

FRANK H. SLEEPER, president of Sleeper & Hartley, Inc., Worcester, builders of spring-making machinery, died Nov. 4. Mr. Sleeper designed and built many spring-making machines for wire-working companies in Canada, and went to Morgan Spring Co. in 1906. He went into business for himself in 1911, and George D. Hartley was taken into the business in 1913. Mr. Sleeper had more than 300 patents to his credit.

ARNAUD G. HELLER, vice-president of Heller Bros. Co., Newark, N. J., file makers, died Nov. 16.

ELMER ELLSWORTH NORTHWAY, secretary-treasurer of the Standard Tool Co., Cleveland, died Nov. 13.

JOHN A. SCHLEICHER, an expert in the design of tools and application of manufacturing methods for several well-known concerns, died recently in his 77th year. Mr. Schleicher entered the employ of Brown & Sharpe Mfg. Co. in 1893 and remained there until 1905. He became an expert on formed tool work while there and had responsible charge of designing sewing machine tools. He went to a number of other concerns, did valuable service for the government during the war, and then was employed by Lufkin Rule Co. from 1919-1926. While with Lufkin, Mr. Schleicher developed a line of precision tools which gave very fine service.



JOHN GOULD JENNINGS

JOHN GOULD JENNINGS, 81, chairman of the board of the Lamson & Sessions Co., Cleveland, died Nov. 21 while en route to St. Petersburg, Fla., where he intended to vacation during the winter. Mr. Jennings was also vice-president of Johnson & Jennings Co., Cleveland, manufacturers of forging and foundry equipment. He had been president of Lamson & Sessions Co. for many years, and was elected chairman in 1929. His son, I. L. Jennings, is vice-president.

E. J. POOLE, vice-president and general manager of the Carpenter Steel Co., died Nov. 16 at the age of 64.

A. N. MYERS, first vice-president of F. E. Myers & Bros. Co., Ashland, Ohio, pump manufacturer, died recently at the age of 75.

ROBERT S. MAC GARVIE, machine tool representative of Brown & Sharpe of New York, Inc., died Nov. 26 after a long illness.

MEETINGS

AMERICAN ENGINEERING COUNCIL. Eighteenth annual assembly, Jan. 13-15. Hotel Mayflower, Washington, D. C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting. New York, N. Y. December 6-10. Secretary, 29 W. 39th St., New York.

AMERICAN STANDARDS ASSOCIATION. Annual Meeting, Dec. 1. Hotel Astor, New York.

CHEMICAL EXPOSITION. Grand Central Palace, New York. Dec. 6-11.

NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting, Dec. 7-9. Waldorf-Astoria Hotel, New York.

NATIONAL STANDARD PARTS ASSOCIATION. Annual convention and show, Nov. 29-Dec. 11. The Sherman Hotel, Chicago.

SOCIETY OF AUTOMOTIVE ENGINEERS. National Production Meeting. Hotel Durand, Flint, Mich. Dec. 8-10. Annual meeting, Jan. 10-14. Book-Cadillac Hotel, Detroit.

BUSINESS ITEMS

The Stewart-Warner Corp., will transfer its refrigerator manufacturing operations from Chicago to Indianapolis where the company has acquired a new plant from the trustees of the Marmon Motor Car Co., according to an announcement by J. E. OTIS, JR., president of Stewart-Warner.

General Shaver Corp., a division of Remington-Rand, Inc., has leased 20,000 sq. ft. of space in the plant of the former Locomobile Co. of America, 2 Main St., Bridgeport, Conn. The main plant is at James St.

Western Insulated Wire Inc., 1001 East 62nd St., Los Angeles, Calif., has started production of rubber-covered insulated wire. A. D. NAST, JR., is president and EDWARD H. LEWIS, vice-president.

Cuno Engineering Corp., Meriden, Conn. is constructing a 40 x 100 ft. addition, 2½ stories high.

Hanson-Van Winkle-Munning Co., Matawan, N. J., has appointed the Chamberlain Co., Inc., 2550 E. Plympic Blvd., Los Angeles, as distributor for its plating supplies in Southern California.

Schramm, Inc., manufacturers of air compressors, West Chester, Pa., has completed a 25,000-sq. ft. factory addition.

Hammond Machinery Builders, Kalamazoo, Mich., have appointed W. J. Bach, 1400 Tenth Place South, Birmingham, Ala., as representative in the sale of grinders for foundry use.

Kropp Forge Co., 5301 Roosevelt Road, Chicago, is completing a new machine shop and expanding its forging department.

The Milwaukee Gear Co., 3844 North Church Street, Milwaukee, is remodeling and installing a machine shop at an estimated cost of $20,000 not including the cost of machinery.

Falk Corp., 3001 West Canal St., Milwaukee, is planning a welding shop which is expected to cost approximately $65,000 not including equipment. The shop will be 65 by 308 feet and one story high.

Carl Zeiss, Inc., 485 Fifth Ave., New York, N. Y., is now distributing its line of Zeiss precision gaging tools and instruments direct from the New York office. A new department has been organized under the care of F. LOEWEN. Service will be given, and minor repairs can be effected.

Purchase of the International Fork & Hoe Co., New Haven, Ind., has been announced by the officials of the American Fork & Hoe Co., Cleveland. The New Haven plant and the Fort Wayne branch of the American company will be merged with headquarters at Fort Wayne.

The Hendey Machine Co., has appointed FLOYD C. PARMAN as sales manager of the Chicago territory, with offices at 565 Washington Blvd. Mr. Parman was formerly sales manager of the company's central New York territory with offices in Rochester. E. J. RAY has been appointed district sales manager at Rochester, with offices at 521 Commerce Bldg.

The Maritime Transport Co., 25 Broad St., New York, N. Y., freight forwarders, has inaugurated a service of surveying foreign markets, contacting desirable representatives or distributors, furnishing statistics showing exports of any commodity for any country, and issuing confidential reports on those who can be recommended for the handling of various lines.

The Keene Rotary Engine Corp., Los Angeles, Calif., has been incorporated and capitalized at $100,000. Directors are C. W. KEENE and W. FORDYCE, both of Los Angeles.

PATENTS

November 9, 1937

Metal-Working Machinery

Material Working Apparatus, Multiple-Spindle Drill. John S. Barnes, Paul R. Guirl and George C. Johnson, Rockford, Ill., assigned to W. F. & John Barnes Co., Rockford, Ill. Patent 2,098,220.

Drill Grinding Machine. Robert C. Weishampel, Paterson, N. J. Patent 2,098,267.

Machine for Generating Throated Gear Elements. Edward W. Miller, Springfield, Vt., assigned to The Fellows Gear Shaper Co., Springfield, Vt. Patent 2,098,428.

Grinding Machine for Non-Circular Shapes. Everard Stubbs, Springfield, Vt., assigned to Norton Co., Worcester, Mass. Patent 2,098,438.

Parts and Mechanisms

Hydraulic Motor for Rotary Spindle Machines. Elek K. Benedek, Bucyrus, Ohio. Patent 2,098,213 and 2,098,214.

Spur Gear. Albert Forster, Milanino, Italy. Patent 2,098,864.

Processes

Method of Preventing Contact Seizure of Metal Parts. Arthur L. Parker, Cleveland, Ohio. Patent 2,098,256.

Electric Welding. David T. May, Port Washington, N. Y., assigned to Bell Telephone Laboratories, Inc., New York, N. Y. Patent 2,098,300.

Apparatus for Applying Abrasive to Polishing Wheels, Belts, or the Like. Joseph S. Porter, New Haven, Conn., assigned to D. & H. Scovil, Inc., Higganum, Conn. Patent 2,098,306.

Tools and Accessories

Tool-Holding Chuck and Collet Therefor. Harry G. Procunier, Chicago, Ill., assigned to Procunier Safety Chuck Co., Chicago, Ill. Patent 2,098,675.

Work Locating Indicator for Jig Boring Machines. John M. Rusnak, West Hartford, Conn., assigned to Niles-Bement-Pond Co., New York, N. Y. Patent 2,098,838.

November 16, 1937

Metal-Working Machinery

Chaser Grinding Means. Clarence S. Mueller, Point Place, Ohio. Patent 2,099,074.

Grinding Machine. Adolph L. De Leeuw, Plainfield, N. J., assigned to Norton Co., Worcester, Mass. Patent 2,099,161.

Parts and Mechanisms

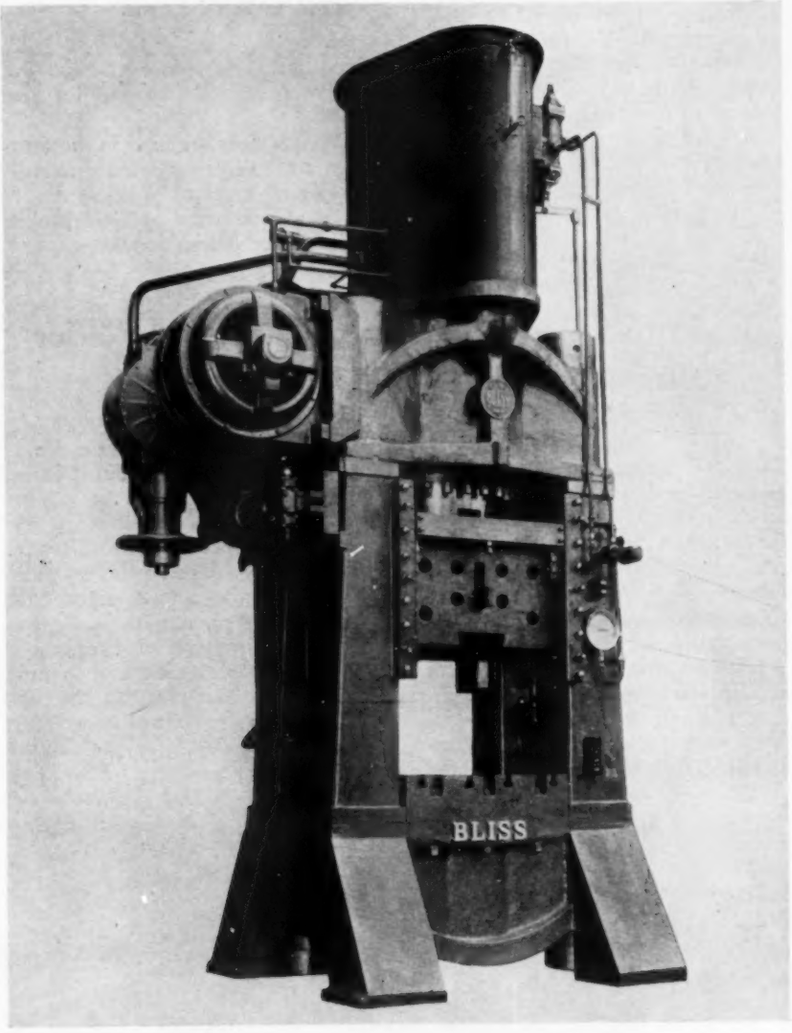
Speed Control Mechanism. Paul A. Chamberlain, Chicago, Ill., assigned to Chicago Flexible Shaft Co., Chicago, Ill. Patent 2,099,050.

Blank Feeding Means. Heyman Rosenberg, New York, N. Y. Patent 2,099,232.

Tools and Accessories

Portable Pressure Fluid Actuated Tool. Ernest H. Shaff, Grand Haven, Mich., assigned to William H. Keller, Inc., Grand Haven, Mich. Patent 2,099,280.

SHOP EQUIPMENT NEWS



Bliss 1,000-Ton "Hydro-Dynamic" Press

The 1,000-ton "Hydro-Dynamic" press, offered by E. W. Bliss Co., 53rd St. & Second Ave., Brooklyn, N. Y., features heavy-frame construction, adjustability of stroke and finger-tip control. Side frames are keyed to the crown and bed so that the housings, rather than the tie rods, take any torsional strain. A deep slide is guided by long, adjustable gibs. Heavy ribs stiffen crown and bed.

Full electric finger-tip control is provided for production operation of the press and for inching the slide in setting-up. Three forward speeds and a high-speed return are featured. The three forward speeds include a high-speed positive advance of 1,100 in. per min., and intermediate pressing speed of 60 in. per min. on pressure capacities up to 250 tons, and a slower pressing speed of 20 in. per min. on pressure capacities over 250 tons. Change from one speed to another is automatically controlled as the pressure increases. Change from quick approach to intermediate speed may be governed by the position of the slide, so that the slide will slow to intermediate speed just before contacting the work.

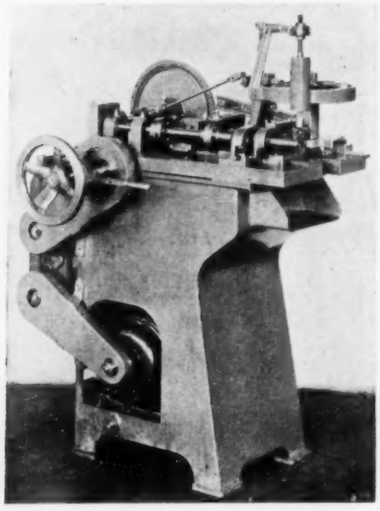
A choice of operation under or over 250 tons can be made by simply turning a selector switch. When the press is operating at pressures below 250 tons, the slow pressing speed is eliminated, as the 1,100-ton pressing area is not used. With this choice of operation, pressure is adjustable from below 50 tons to 1,000 tons.

A hydraulic cushion is provided in the bed for blank-holding or shape-holding purposes. Having a capacity of 100 tons, the pressure of the cushion is always indicated, whether or not the cushion is moving. Return of the cushion during the return stroke may be delayed to allow the main slide to clear the work. A special, normally open type prefill valve is used to fill the main cylinder from the tank during the positive quick closing of the press. This insures a free flow and protects the press against cavitation when pressure is applied.

Specifications: maximum length of stroke, 15 in.; shut-height or die-space, 20 in.; bed area, front to back by right to left, 42x43 in.; area of slide face, 37x37 in.; diameter of cushion pad in bed, 27 in.; stroke of cushion pad in bed, 7½ in.; speed of press when operating continuously with full-automatic control, 16 cycles per min. **(1)**

S. & H. Torsion-Spring Winding Machines

A line of improved torsion-spring winding machines has been announced by Sleeper & Hartley, Inc., 335 Chandler St., Worcester, Mass. All spindles of these machines are mounted in ball or anti-friction bearings. Standard equipment includes a double-acting cutting-off slide which



will cut off both right- or left-hand springs and can be used to provid bends on the long end of torsion springs. This eliminates the need for an additional operation.

These machines will accommodate a four-slide attachment for cutting and forming ends. Seven types of torsion springs that previously required two or more operations on separate machines can be made complete in a single machine when this attachment is used. A variable-speed drive, with individual motor o- single-pulley main drive is provided.

Specifications, No. 0 Series 607 machine: Wire range, No. 43 to No. 23; standard production, 50 springs per min.; production with variable-speed attachment, 25 to 100 springs per min.; maximum number of turns per coil, 25; wire feed, 6¼ in.; height of wire line from floor, 36¾ in.; floor space required, 22x28 in.; weight with motor and variable-speed attachment, 440 lb.; motor required, ¼ hp.

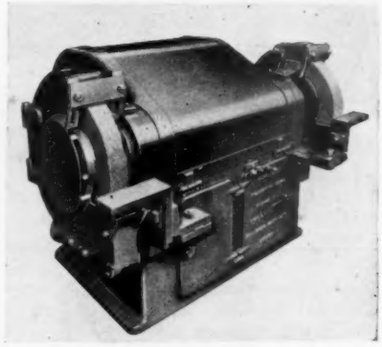
Specifications, No. 1 Series 614 machine: Wire range, No. 29 to No. 16; production with variable-speed attachment, 20 to 80 springs per min.; maximum number of turns per coil, 20; wire feed, 8 5/16 in.; height of wire line from floor, 36 in.; floor space required, 36x30 in.; weight with motor and variable speed attachment, 715 lb.; motor required, 1 hp. This machine is shown in the accompanying illustration.

Specifications, No. 1½ Series 618 machine: Wire range, No. 20 to No. 14; production, 10 to 20 springs per min.; wire feed, 11½ in.; height of wire line from floor, 33½ in.; floor space required, 44x76 in.; weight with motor, 2,434 lb.; motor required, 3 hp.

Specifications, No. 2 Series 626 machine: Wire range, No. 20 to No. 8; production, 9, 12 and 18 springs per min.; maximum number of turns per coil, 40; wire feed, 19 in.; height of wire line from floor, 36 in.; floor space required, 64x52 in.; weight with motor drive, 4,300 lb.; motor required, 5 hp. **(2)**

Kling Type AT Heavy-Duty Grinder

A wheel-wear compensator is featured in the Type AT heavy-duty grinder announced by Kling Bros Engineering Works, 1301 N. Kostner Ave., Chicago, Ill. Wheel speed is increased by turning a handwheel making it possible to maintain an approximate peripheral speed of 8,500 surface ft. per min. A lever mechanism between the spark guards and the compensator prevents use of new wheels at high speeds, as the speed must be reduced before the guard can be raised to install a new wheel.



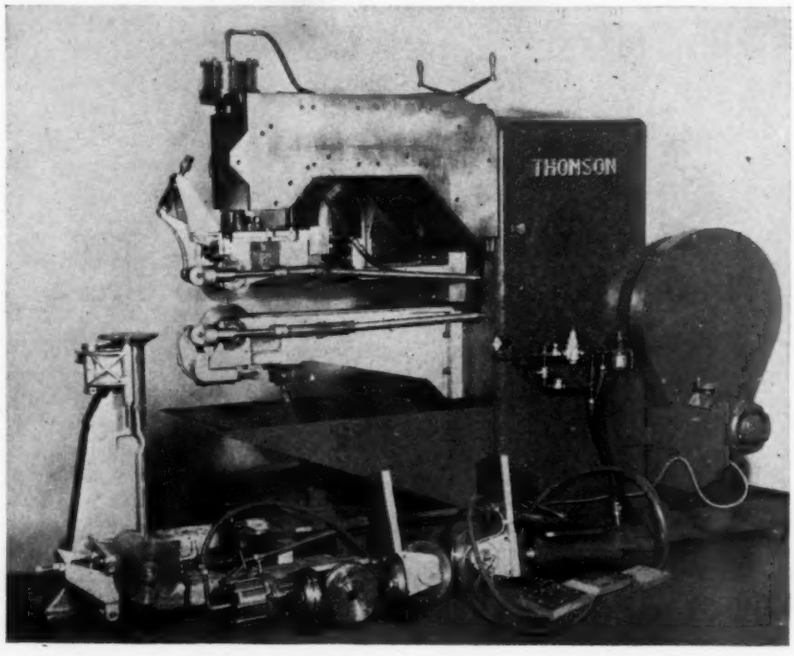
Seven V-belts are used in the main drive and the spindle shaft is split for easy replacement of belts. A special work rest with pedal control is available for production work. **(3)**

Thompson-Gibb "Universal" Seam Welder for Aluminum and Stainless Steel

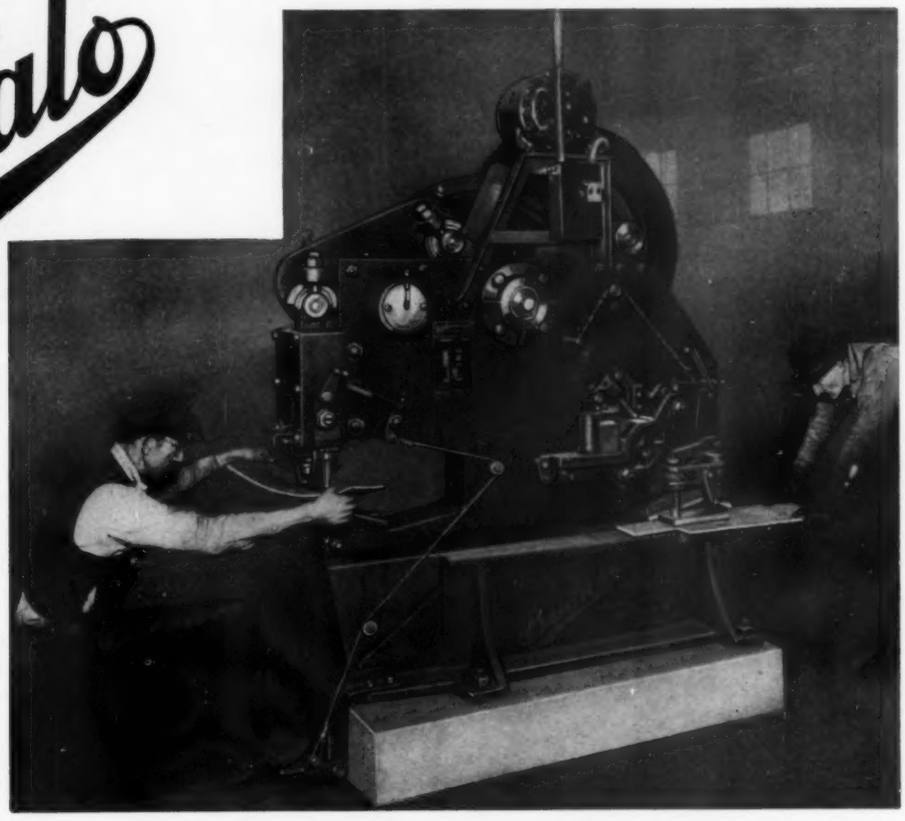
Adaptable for longitudinal and circular seam welding, the "universal" seam welder is built by Thompson-Gibb Electric Welding Co., 164 Pleasant St., Lynn, Mass. It will weld aluminum, stainless steel and non-ferrous alloys. Longitudinal seam welding is performed with the heads shown, while an alternate head and lower arm are substituted for circular seam welding.

In addition, there are two special heads with an assortment of short-circuiting rolls that can be mounted on a special bracket for series welding. The head can be mounted either in a vertical position or at various angles on the finished surface at the side of the upper head. In this way, the machine can be set up in short order to handle almost any special seam welding operation.

Welding pressure is adjustable and is applied by means of a pressure cylinder mounted on the upper head. Precise control of welding variables is claimed for the control unit installed. **(4)**



Have You Seen it *the* "Buffalo" UNIVERSAL IRON WORKER *IN ACTION?*



• It's a genuine pleasure to see these industrial giants "do their stuff"—3 operations at once if you wish—punching, shearing, trimming. Angles, tees, rounds, squares, flat steel—all taken in their stride, without hesitation.

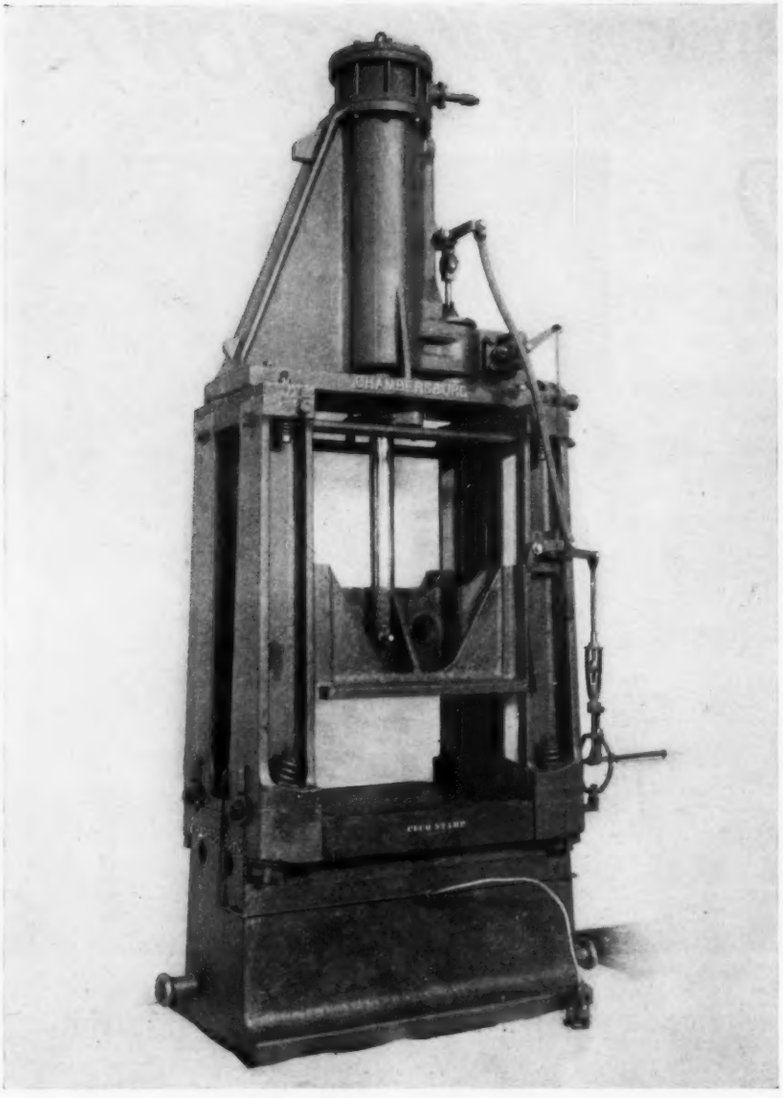
Does performance like that reduce production costs? Well, we wish you could see the records in the hundreds of modern industrial plants where "Buffalo" Universal Iron Workers have replaced obsolete methods of iron working.

There are a wide range of sizes, all built with electrically welded armor plate frames. Also available with built-in notching and coping device.

Write for details and Bulletin 331.

BUFFALO FORGE COMPANY
448 BROADWAY, BUFFALO, N. Y.

Branch Engineering Offices in Principal Cities In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



Chambersburg "Cecostamp" Hammer for Sheet Metal Forming

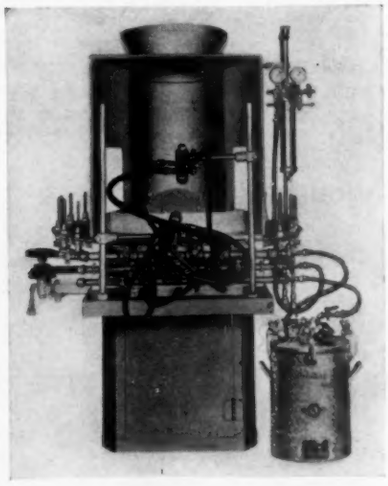
Designed to replace the "rope drop" hammer for drop stamping sheet metal parts, such as are required in the construction of modern streamlined trains and airplanes, the "Cecostamp" pneumatic hammer announced by Chambersburg Engineering Co., Chambersburg, Pa., is said to produce formed sheet metal parts efficiently and economically. These hammers are made in a wide range of sizes to accommodate all sizes of stampings. It is claimed that the "Cecostamp" can be controlled as easily as the operator would use a hand hammer. Movement of the single operating lever governs the movement of the ram, giving complete control of both direction and speed and hence controlling the work done. The lever is pivoted to be accessible to the operator from the preferred position for each die.

A working area of the bed and ram of 90 in., left to right, and 48 in. front to back, is provided in the "Cecostamp" shown in the accompanying illustration. Over-all height from bottom of anvil to top of cylinder cover is 20 ft. 9 in. Hammer may be operated from the normal shop supply of compressed air, ranging from 75 to 100 lb. per sq.in. Smallest hammer of this type measures 41x36 in. on the working face of the anvil and ram, while the largest at present measures 120x120 in.

Frames of these hammers are made of I-beam sections, heavily ribbed and mounted rigidly on the anvil. Four frames are used to maintain accurate guidance of the ram when dies of unusual shape are mounted. The bars at the top of the frame, running left to right and front to back, are fitted with heavy coil springs to maintain accurate alignment. Heavy bolts and springs are positioned at an angle to secure the frames to the anvil and insure maintenance of alignment after impact. Frames are adjustable in a right to left direction across the anvil.

A pneumatically operated safety latch maintains the ram in either of two raised positions while the operator is working on dies or loading the hammer. The operator must keep his foot on the pedal while the ram is in motion and removal of the foot from the pedal permits the safety latches to project under the ram, holding it in the raised position.

A cylinder safety-cover provides a cushion of live air at the top of the cylinder not subject to the pumping of the hammer. This limits the stroke, protects the cylinder and eliminates the hazard and expense of broken cylinder covers in the event of a rod breaking or loosening. The operating valve is of the balanced-piston type and is actuated by a cam on the ram incline. Porting is so arranged that rapid motion of the control lever permits free drop of the hammer, while a slow motion permits a corresponding decrease in speed with a squeeze exerted at the end of the stroke. **(5)**



DeVilbiss Type YB Finishing Machine

Type YB improved rotary spray-finishing machine, announced by The DeVilbiss Co., Toledo, Ohio, is designed for high-speed, automatic finishing of small- and medium-size articles. It is claimed that this machine is capable of exceeding 3,600 finished, small, light-weight articles per hour. It is equipped with spin-

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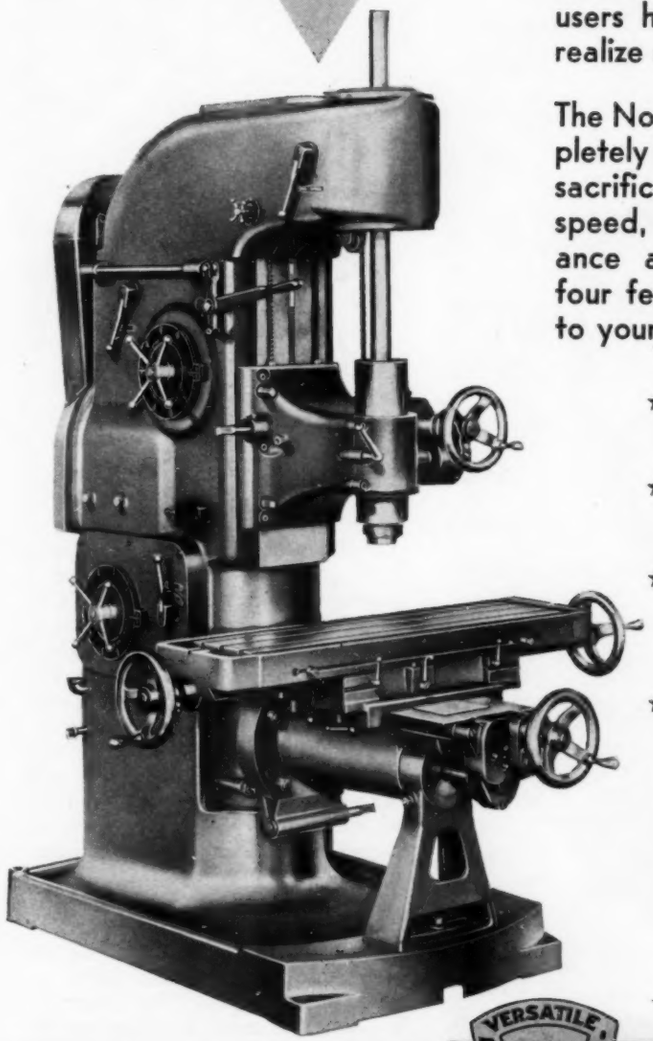
KNIGHT MILLER No. 40



Faster and more accurate work, greater earning power, and ability to handle a wide variety and range of work—that's the combination you get when you put a Knight Miller No. 40 on the job. In fact, Knight Millers have proved so efficient, versatile, and profitable that numerous users have added additional Knights to realize even greater gains.

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★ **Accuracy** for efficiently boring jogs and other precision work.

★ **Speeds** for large or small cutters on boring or milling with sixteen changes in geometrical progression.

★ **Power** and rigidity to transmit the full five horse power of the motor with which it is equipped.

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W. B. KNIGHT MACHINERY CO.

• ST. LOUIS, MISSOURI •

dles, automatic spray gun, automatic control valve, hose connections and other accessories. Unit is available in three sizes for light, medium and heavy duty.

All sizes are equipped with improved speed reduction unit, and may be operated at several different speeds to fit the requirements of the operation. If desired, the machine can be provided with a cam so that the spray gun operates at every second spindle, when the machine is used for the finishing of larger articles.

Turntable is driven by a ¼-hp. motor, the speed of which is determined by the work to be done. This turntable will accommodate 15, 20, 25, 30, 40 and 50 spindles, dependent on the size of the pieces to be sprayed. Exhaust chamber can be furnished specially designed to meet individual requirements. A drying oven can be mounted on the machine if necessary. **(6)**

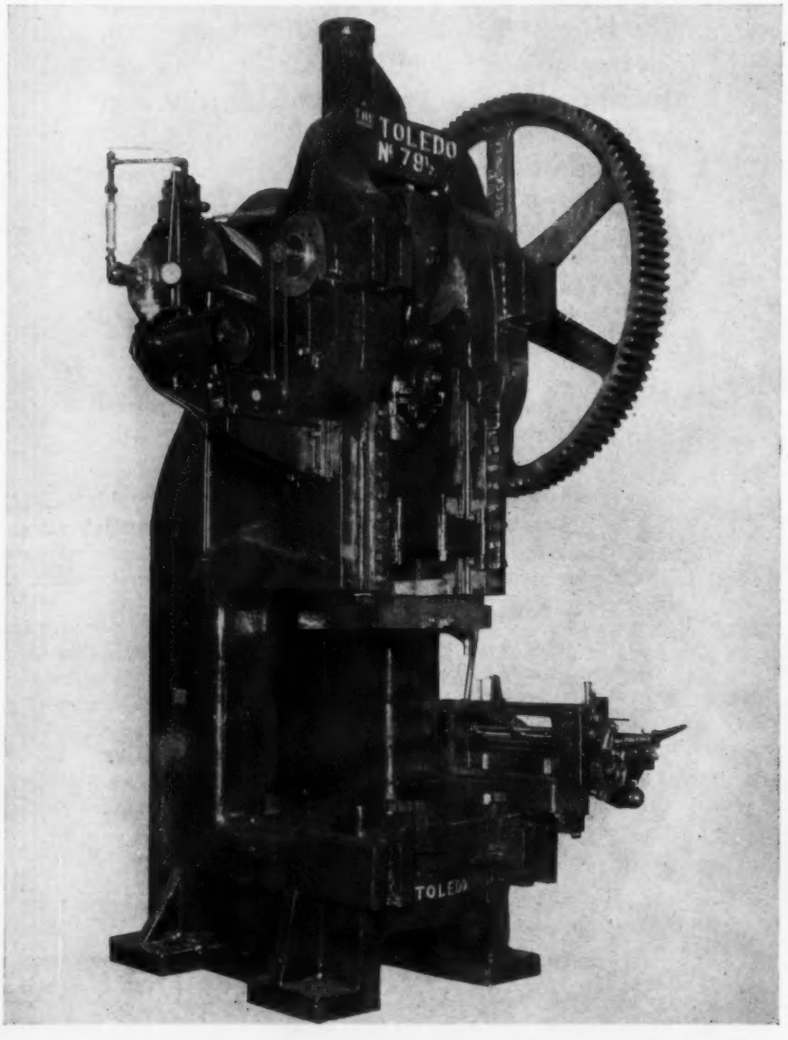
Toledo No. 79½ Open-Back Automatic-Feed Punch Press

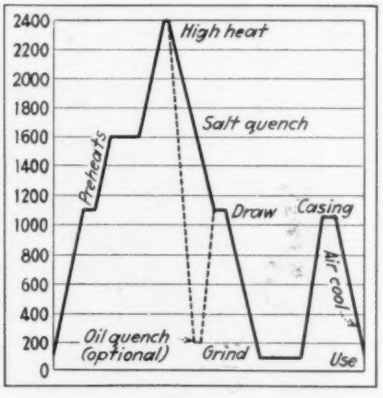
An electric pushbutton control, requiring the operator to keep both hands on palm buttons until completion of the working portion of the stroke, is featured in the No. 79½ open-back press announced by The Toledo Machine & Tool Co., 1420 Hastings St., Toledo, Ohio. This press has a single-roll feed with a seven-roll, power-driven straightener to provide an automatic feed for stock from 0 to 12 in. This feed is mounted on the bolster and the level at which the rolls operate can be adjusted up or down to suit the height of the dies.

The flywheel-type multiple-disk friction clutch is of the fast-acting pneumatic type. Elimination of the link action of older types of clutches is claimed to eliminate sensitivity to wear or to heating. Both the drive shaft and the flywheel are mounted on Timken anti-friction roller bearings, while the frame and connection bearings are bronze bushed. A 15-hp., 1200 r.p.m. motor is required.

An anti-repeat mechanism, an air brake for stopping the flywheel, an air counter-balanced slide, and a crossbar knockout are among the features claimed for this press. In conjunction with the pushbutton control, electrical protective switches can be incorporated in the dies or on the stock feeds and hooked up in series with the stop button to stop the press should a jam or other mishap occur at the feed.

Specification: Stroke, 12 in.; adjustment of stroke, 3 in.; distance from bed to slide, stroke down and adjustment up, 20 in.; bed area, front to back by right to left, 28x41 in.; distance between gibs, 21½ in.; area of flanged slide, 24x28 in. **(7)**

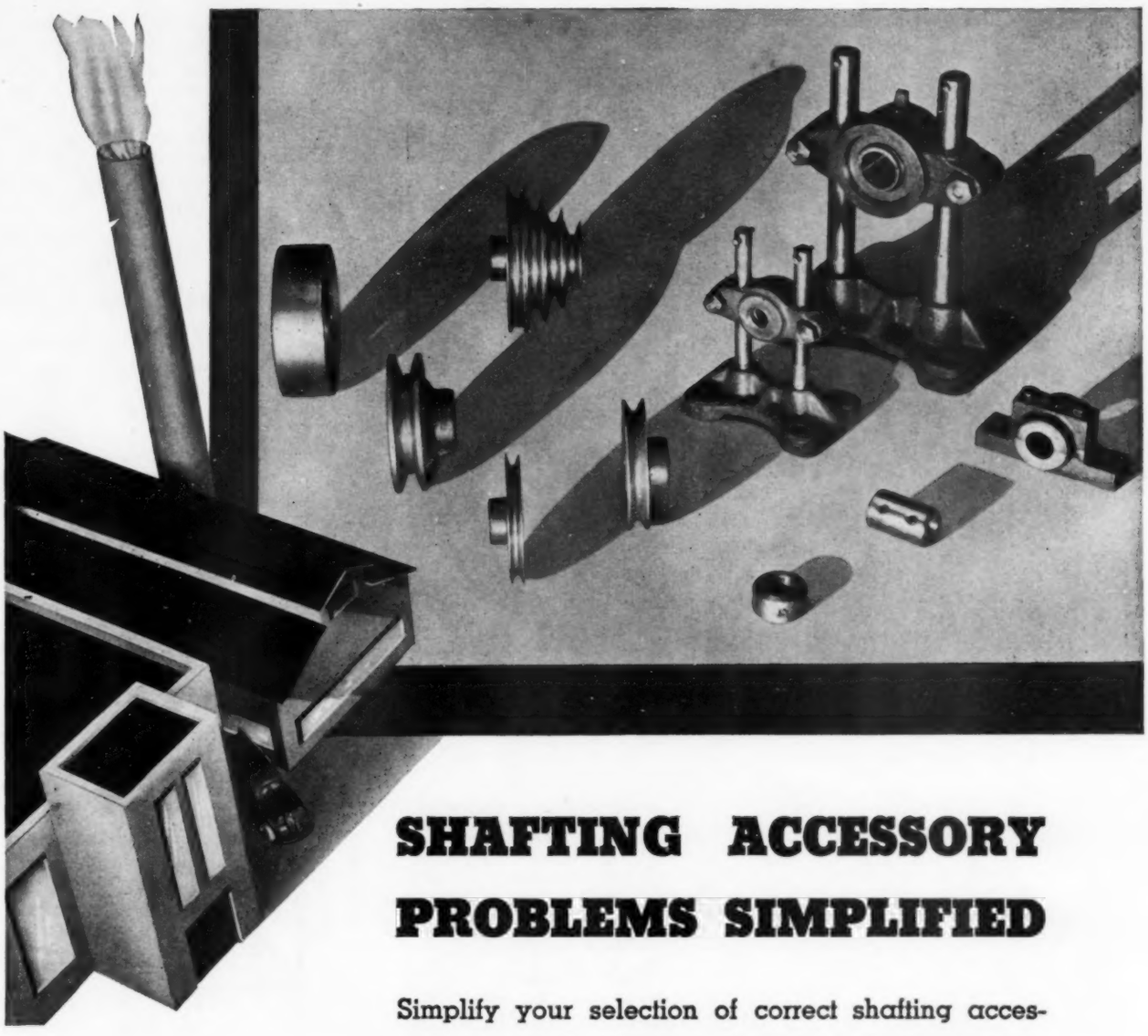




Houghton Steel-Treatment Cycle

Development of a comprehensive cycle of high-speed steel treatment is announced by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. This cycle of treatment is shown in the accompanying diagram. For the preheat, a neutral hardening salt, which will neither carburize nor decarburize, is used. For high heat, the "Liquid Heat No. 2400" salt with a working range to 2,500 F. is recommended. Work may then be quenched in oil or given a salt-bath quench.

After being drawn, the work is ground and a case is superimposed by a further liquid bath, giving an outer case ranging from 0.001 to 0.002 in. in depth. This treatment is claimed to result in a hardness of more than 1,000 Brinell and to increase production of high-speed tools from 25 to 300 per cent. **(8)**



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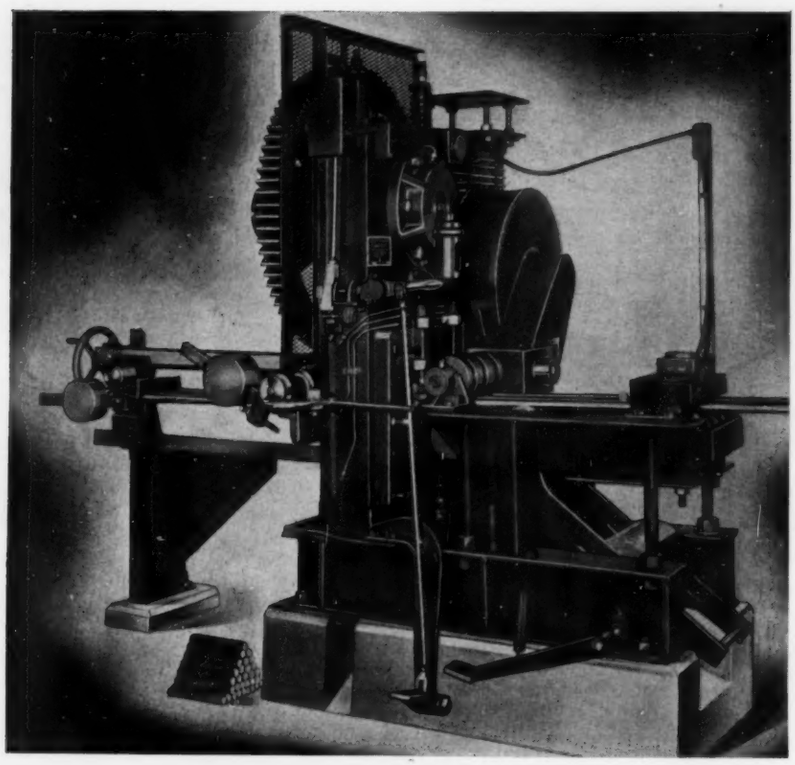


Buffalo Automatic Bar-Stock Shear

Designed for high-speed, accurate shearing of bar stock for bolts and rivets, the automatic shear announced by Buffalo Forge Co., 448 Broadway, Buffalo, N. Y., is equipped with power feed rolls. These rolls are made to grip and pull the stock into the shear only when the knives are open on the "up" stroke. They release their grip when the stock touches the rear gage and the top knife starts to descend.

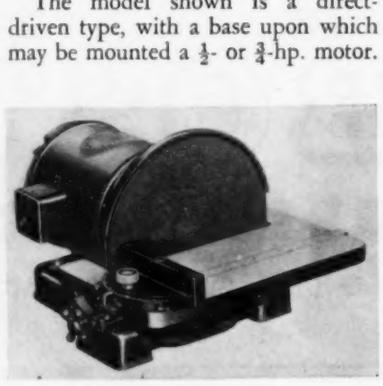
A specialty designed roll automatically adjusts itself to any ordinary irregularities in the bar stock. Three bars are fed and sheared at one time, at a shearing rate of 30 strokes per min. An open-side tilting type gage is provided at the rear of the machine. This gage is easily adjusted for any length of bolt up to 18 in. for automatic feed and 48 in. for hand feeding. A special cropping gage is provided for cutting off 1 in. on each bar at the start of a run, in order to secure a square end.

Clutch may be engaged either by means of a hand lever or by a pedal; both are provided. It is arranged to disengage automatically after each stroke or to run continuously until disengaged by the automatic stop, governed by the length of the bar stock. Drive motor is mounted on top of the shear frame and drives, by means of V-belts, direct to the flywheel. All gears, as well as the flywheel belts and motor pulley, are totally inclosed within metal guards. Various sizes and capacities are available to suit requirements. **(9)**

Delta 12-In. Disk Sanders

Designed to fill the gap between light machines previously available and heavy, permanent-installation machines, two disk sanders announced by Delta Mfg. Co., 620 East Vienna Ave., Milwaukee, Wis., are suitable for use in the machine shop, the pattern shop or the cabinet shop. They are claimed to be heavy enough for accurate finishing, squaring, mitering, fitting and sanding on wood, metal, plastics and other materials.

The model shown is a direct-driven type, with a base upon which may be mounted a ½- or ¾-hp. motor.

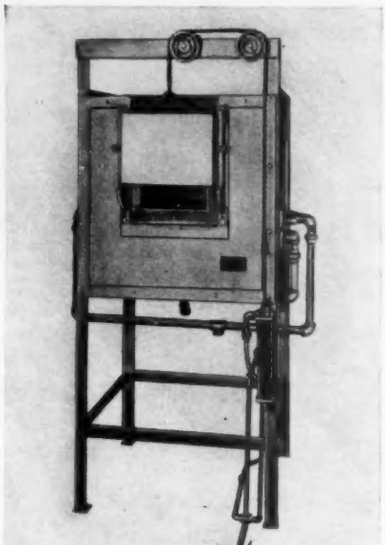


The other model is belt-driven and is designed to be used with an existing drive, or where odd voltage or frequency motors must be used.

Both machines have 12-in. disks and are fitted with 10x16-in. tilting tables with graduated sectors. Tables are provided with a ⅜x¾-in. groove for miter gage or fixtures. **(10)**

National "Equilib" Oven-Type Furnace

Designed for use with controlled atmospheres for heat-treating high-speed steel, the "equilib" furnace announced by National Gas Furnace Co., 112 Point St., Providence, R. I., incorporates a circulating oven-type construction. This consists of U-shaped tray sections of high strength and wear-resisting qualities, providing a uniformly heated work



chamber and recirculation of the furnace atmospheres. Walls are of 2½ in. heavy firebrick plus 4½ in. lightweight insulating firebrick, backed up with 4½ in. of insulation. The National proportioning valve and burner assembly, capable of high temperature and close atmosphere control, is standard equipment. Proportion of air and gas is controlled by means of an adjustable indicator on the air and gas valve. It is claimed that furnaces so equipped make it possible for the operator to duplicate the conditions which yield the best results required for various steels. These furnaces are available in four sizes, with hearth dimensions ranging from 8 x 12 to 15 x 21 in. Door openings range from 6 x 8 to 8 x 15 in. **(11)**

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From a publication's Central Western Manager:

"'What Makes Main Street?' . . . is one of the most outstanding and unique ways of telling a story on lathes that has ever been presented."

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Ever get patted on the back by captains of industry and bigwigs of the press? We've just had that thrill . . . the rippling roars of verbal applause, the flood of favorable comment that has greeted "What Makes Main Street?" Your copy is available via the coupon with a quarter of a dollar—back with interest if it's of no interest to you.

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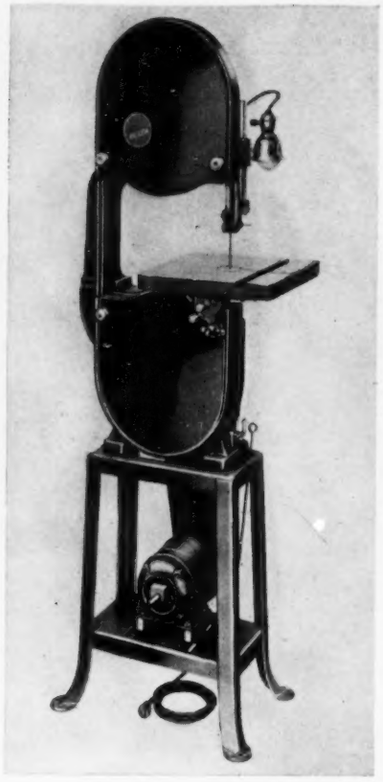


Delta 14-In. Metal-Cutting Bandsaw

Delta Mfg. Co., 620 East Vienna Ave., Milwaukee, Wis., is offering a 14-in. capacity, metal-cutting bandsaw for general shop applications. This saw has capacity for cutting materials up to 6-in. thick. An extension attachment makes it possible to increase the capacity under the guide to 12 in. when necessary.

Five speeds are provided; four for metal, of 125, 175, 250 and 340 ft. per min. and one for wood of 2,200 ft. per min. Slow speeds are obtained through a ball-bearing gearbox while the high speed for cutting wood is obtained direct from the motor by a V-belt drive. Change from low to high speed is accomplished easily. The machine is equipped with sealed pre-lubricated ball-bearing throughout. **(12)**

Nicholson Style J Air-Control Valves

Style J air-control valves, announced by W. H. Nicholson & Co., 231 Oregon St., Wilkes-Barre, Pa., are available for air pressures up to 125 lb. per sq. in. in three- and four-way types. Bodies and seats are of semi-steel and flat disks are of bronze. Port areas are said to be equivalent to the full area of the pipe sizes they accommodate, and port design permits throttling or full opening, as required. Valves can be disassembled for inspection without breaking pipe connections. Operating levers require 90 deg. travel for complete cycle and may be adjusted radially on the valve stem to suit the convenience of the operator. These valves are made in $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ in. sizes. **(13)**

"Permochart" Ink for Recording Charts

A recording chart ink has been developed by the Permochart Co., Koppers Bldg., Pittsburgh, Pa., for use on the renewable, permanent recording charts offered by this company and previously described (*AM*—Vol. 81, page 470). Advantages claimed for this ink are that it starts flowing instantly but does not flood. It is said that it will not cake on the pens, even if they run dry and are left so for several days. Records of 50 hr. duration have been made from one filling of the pen. These inks are made in three colors; purple, red and green. Red is recommended as giving the best contrast with the natural color of the "Permochart". **(14)**

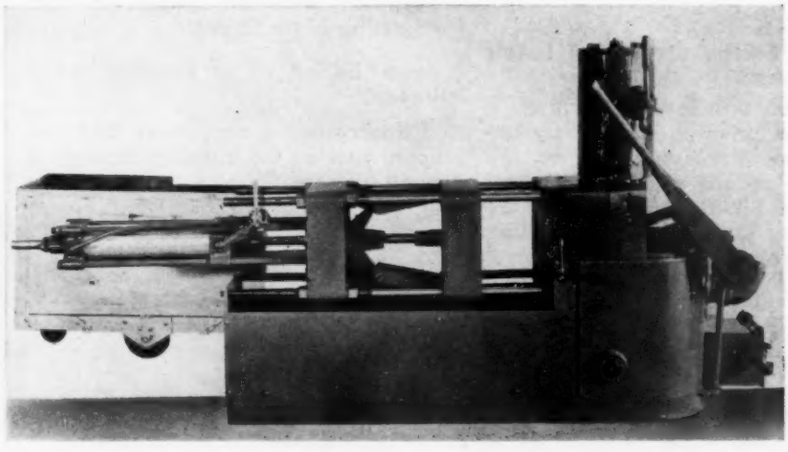
Harvill High-Pressure Die-Casting Machines

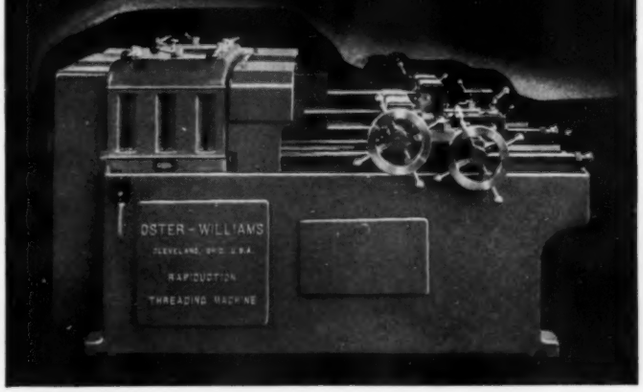
Available in three sizes, the full-pneumatic die-casting machines offered by H. L. Harvill, Inc., 2344 East 38th St., Los Angeles, Calif., are of the high-pressure injector type in which the air does not come in contact with the molten metal. This is claimed to result in castings free from blow holes and porosity. Dies can be changed rapidly, reducing lost time to a minimum on short runs. These machines can be furnished equipped with gas or oil burners, and need only to be connected to the air and fuel supply lines to be placed in operation. The toggle mechanism effectively locks the dies in position.

The No. 4 machine, the smallest offered, is furnished arranged for complete manual, semi-manual, or semi-automatic operation. It is suitable for small-lot production of smaller size parts. Specifications: Size of die plates, $9\frac{1}{2}$x$11\frac{3}{4}$ in.; space between bars, $6\frac{1}{2}$x$8\frac{1}{4}$ in.; die stroke, $6\frac{1}{4}$ in.; maximum die space, 14 in.; approximate number of shots per hour, 500; metal per shot, 3 lb.; net weight, 1,000 lb.

Specifications for No. 5 machine, shown in the accompanying illustration: Size of die plates, 16x18 in.; space between bars, 12x14 in.; die stroke, $10\frac{1}{4}$ in.; maximum die space, 20 in.; approximate number of shots per hour, 400; metal per shot, $7\frac{1}{2}$ lb.; net weight, 3.000 lb.

Specifications for No. 6 machine: Size of die plates, 21x23 in.; space between bars, $14\frac{5}{8}$x$16\frac{5}{8}$ in.; die stroke, 14 in.; maximum die space, 22 in.; approximate number of shots per hour, 300; metal per shot, $9\frac{1}{4}$ lb.; net weight, 5,000 lb. **(15)**





As Good as they Look...

Men who know sound machine-design are instantly attracted by the efficient appearance of Rapiduction Bolt-Threaders . . . . BUT . . . . the reason Rapiductions are jumping to the front in sales is their consistently high record of PROFITABLE PERFORMANCE wherever installed. Write today for descriptive bulletin and get the detailed story of these completely-modern high-production machines.

The three illustrations at left show (top) the double spindle type, (center) single spindle type and (below) double spindle type with 30" carriage for staybolt threading.

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Sales Office: 2049 East 61st St., Cleveland, Ohio
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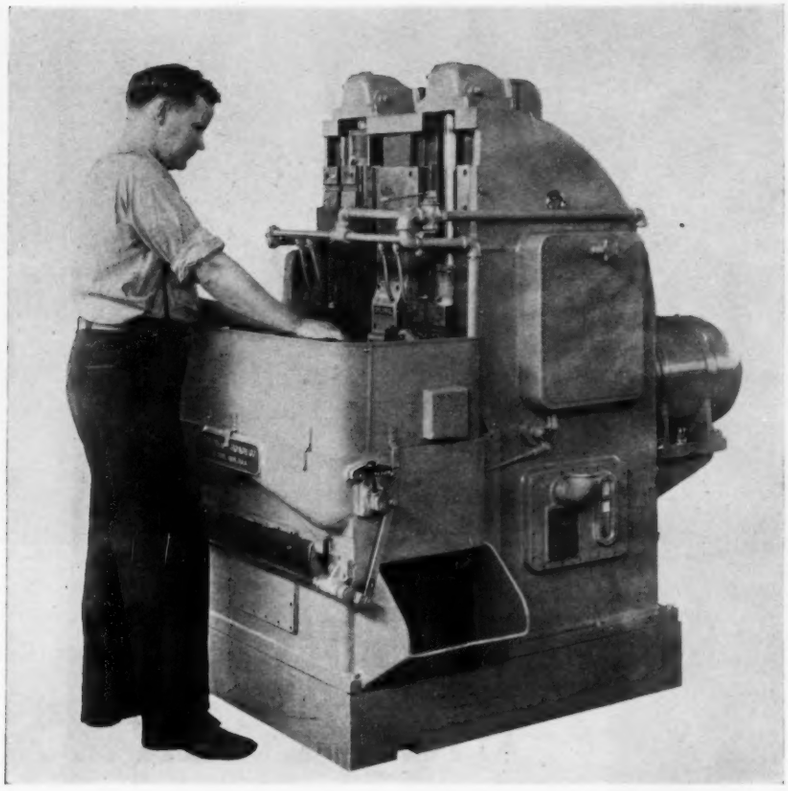
RAPIDUCTION
BOLT THREADING MACHINES



Colonial Alternating Cycle Dual-Ram Broaching Machine

A production of 400 connecting rods and caps per hour is claimed for this continuously operating, alternating-cycle, dual-ram surface broaching machine offered by Colonial Broach Co., Detroit, Mich. Machine is of the vertical type, with an 18-in. stroke and 3-ton capacity per ram. It is particularly designed for broaching the joint faces on connecting rods and caps, the rods being done on one ram and the caps on the other.

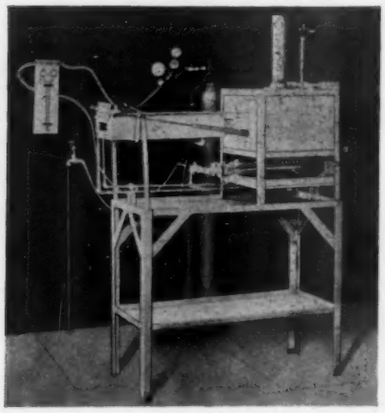
Operation is entirely automatic. While the left ram is traveling downward, broaching the cap, the right-hand ram moves upward on the return stroke, after having broached a rod. During this upstroke, the fixture holding the rod is automatically moved sideways and clamps are automatically released. This permits the operator to remove the finished rod and insert another. Toward the end of this same stroke, the part is automatically clamped and the fixture automatically returned to broaching position. The right-hand ram now travels downward and the left-hand ram upward. The same cycle is repeated for the left-hand ram, a finished cap being removed and a rough cap being placed in the fixture by the operator.

Operation is hydraulic throughout, including fixture and clamping operation. Approximately 0.010 in. of stock is removed in the operation, with a finished tolerance of 0.0005 in. The machine is provided with a knee control, so that it can readily be stopped at any time, even though the operator's hands are both occupied. **(16)**

Baker Hydrogen Annealing Furnace

This gas-fired annealing furnace, offered by Baker & Co., Inc., Murray & Austin Sts., Newark, N. J., is an adaption of the standard gas-fired toolroom unit. Pre-heated hydrogen, or other deoxidizing gases, flow into the heating chamber where they reduce the oxide which may occur upon the surfaces of the metal under treatment. Upon completion of the annealing cycle, the tray is pushed into the cooling chamber in the rear. Here, in the same atmosphere, the metal cools below the point where oxidation may recur, after which the work is removed from the furnace.

Two sizes are available. The No. 11 unit has a 6x8 in. heating space with a height of 1½ in. Height of furnace and stand to base of chimney is 49 in. Floor space occupied is 18x44 in. This furnace is claimed to reach a temperature of 1,500 F. in 30 min., 1,600 F. in 35 min. and 1,850 F. in 75 min. These tempera-



tures are obtained with a gas having 550 B.T.U., without a blower.

Unit No. 12 has an 8½x15 in. heating space, with a height of 2½ in. This furnace, with stand, measures 51 in. in height to base of chimney and occupies 24x60 in. of floor space. Both types are equipped with a Weston pyrometer and have a temperature range to 1,850 F. **(17)**

Chapman "Valcase" Liquid Carburizer

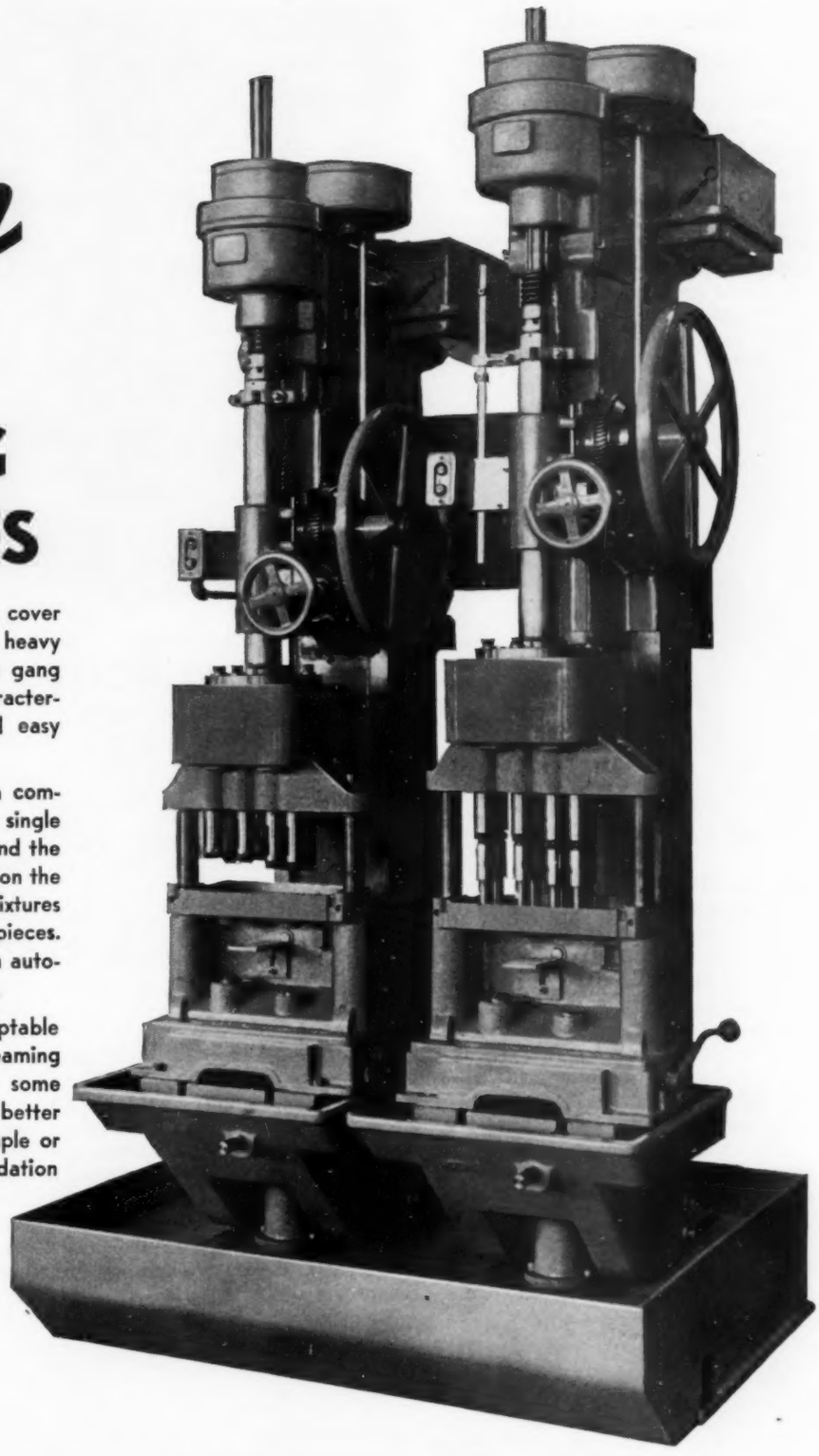
"Valcase" liquid carburizer, announced by the Chapman Valve Mfg. Co., 203 Hampshire St., Indian Orchard, Mass., is a fused salt-bath mixture that is claimed to be readily melted in ordinary pot-furnaces without excessive fuming or smoking. Case depths, ranging from 0.015 in. in 30 min. to 0.045 in. in 4 hr., can be obtained. Temperature range of the bath is 1,450 to 1,700 F. Recommeded operating temperature is 1,650 F., although maximum case depths can be secured at 1,700 F.

Other new products offered include "Valtemp" and "Valdraw." "Valtemp" is a combination of salts for drawing steel at temperatures from 300 to 700 F. It is claimed to replace oil tempering baths and work produced from this bath is said to retain its cleanliness during long periods of use.

"Valdraw" is a drawing bath for tempering from 1,000 to 1,400 F. and is used for drawing all types of steel where clean and uniform heating is considered necessary. **(18)**

Gear

FEED DRILLING MACHINES



Baker gear feed drilling machines cover the wide range from single-spindle heavy boring machines to multiple-spindle gang drilling equipment. All are characterized by design for convenient and easy operation.

The 121 Type illustrated, shows a combination of a two gang unit on a single base. The first multiple head drills and the second performs tapping operations on the same steering case cover. Special fixtures are used for rapid handling of the pieces. The tapping unit is equipped with an automatic electrical reverse mechanism.

Baker gear feed machines are adaptable to practically any drilling, boring, reaming or tapping operations. However, some production problems are answered better with a Baker hydraulic. Submit sample or blue print for a prompt recommendation by our engineering department.

BAKER BROTHERS, INC.
TOLEDO, OHIO
Newark, N. J. office 1060 Broad St.

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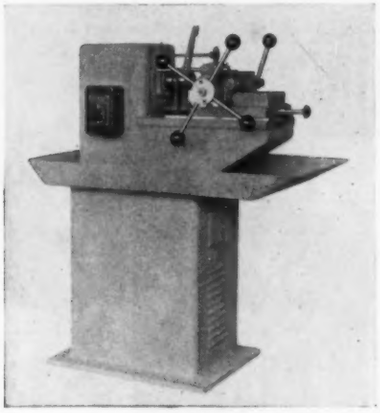
Geometric No. 14 Threading Machine

Intended for the precision threading of duplicate parts, the No. 14 threading machine announced by The Geometric Tool Co., New Haven, Conn., will cut standard pitches up to $\frac{9}{16}$ in. and fine pitches in larger sizes. Either a Style KD diehead with conventional milled or tapped chasers, or the Style TR diehead with tangential or circular chasers may be employed.

Either a standard two-jawed vise or a standard collet chuck may be used for holding work to be

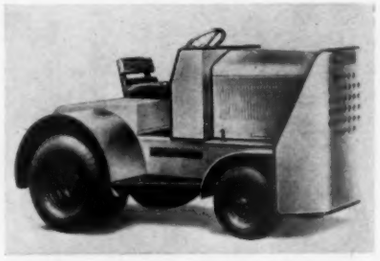


threaded. For simple jobs, the user can purchase the machine without work holder, mounting his own design of holder on the machine platen. Both the vise and the collet chuck are equipped with an adjustable alignment feature. Pivoted on large bolts, both vertical and horizontal adjustment of the work holder may be made without the use of gibs or shims.

An automatic work gage insures proper setting of the work. This gage swings out of the way when the work is tightened in the vise. Pick-off change gears permit a wide range of threading speeds, which is desirable when threading different diameters and different materials. Machine is driven by double V-belt from a motor mounted in the base. All controls and working parts are readily accessible. Coolant is furnished by an automatic reversible-type pump. **(19)**

Mercury "Super-Huskie" Gasoline Tractor

Features of maneuverability, tractive effort, smooth handling, wide speed range and appearance are claimed for the "Super-Huskie" industrial gasoline tractor announced by The Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill. This tractor employs a "Chrysler" 6-cylinder heavy-duty, truck-type engine governed at 2,400 r.p.m. Rear-axle ratio is 12.23 to 1, through double-reduction bevel and spur gear drive. Over-all length is 102 in. and maximum width is 65 in.



Having a 60-in. wheel base, this tractor can be turned in right-angle intersections of 85-in. wide industrial plant aisles.

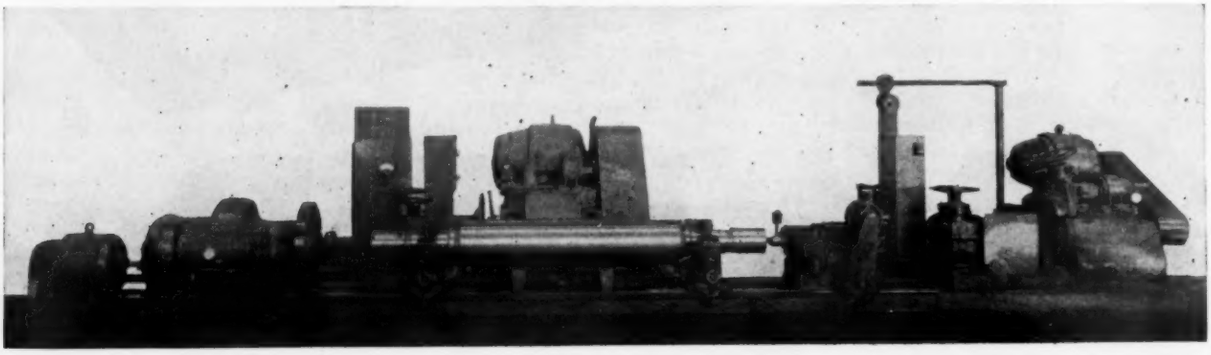
This tractor is equipped with a truck-type four-speed transmission with provision for power take-off. Spring suspension is provided both front and rear. Battery, self-starter, horn and pneumatic tires are standard equipment. Weight is 4,850 lb., and maximum sustained draw-bar pull in low gear is 4,000 lb., at 2.25 miles per hour. **(20)**

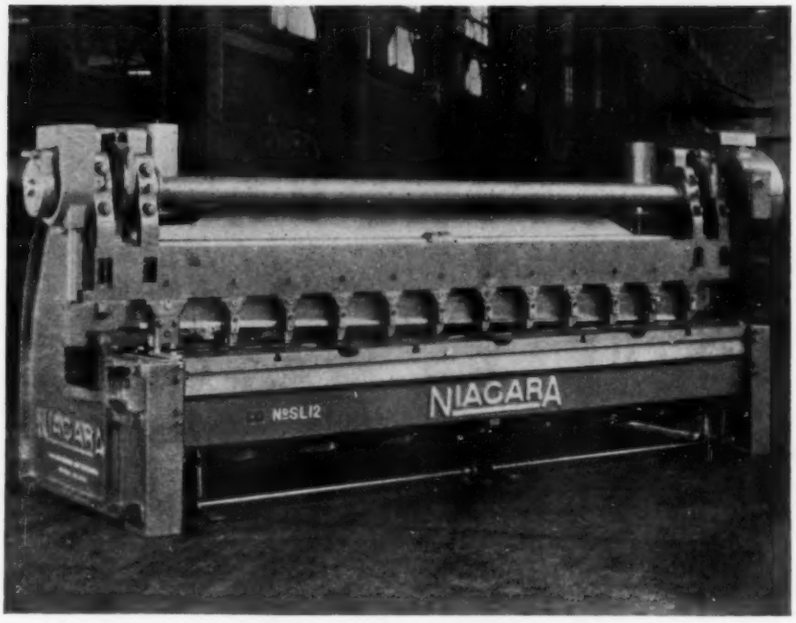
Landis Special "Type 30" Roll Grinder

Landis Tool Co., Waynesboro, Pa., has developed and installed a specially arranged grinder for rough and finish grinding special-alloy chilled-iron rolls. These rolls contain a high percentage of nickel and show a Scleroscope reading of 80 to 85. Turning tools would not stand up, because of the toughness of the material, and it was decided to rough and finish grind them in the same machine.

For this purpose a 36 in. by 18 ft. standard Type 30 roll grinder was arranged with an extra long rear-bed section. This section mounts two grinding wheel carriages. A conventional Type 30 wheel carriage serves for the finishing operation. The other carriage is specially designed for the roughing operation. Because of the length of the rear bed section, either carriage can be run to the end of the bed and the entire length of the roll can be ground by the other carriage.

Two 36x6x18-in. wheels are mounted against each other in the center of a massive wheel spindle in the roughing carriage. These wheels are carried between bearings, not on the end of the spindle. This roughing spindle is $5\frac{1}{4}$ in. diameter at the bearings and 8 in. diameter between the bearings and is 58 in. long. Anti-friction bearings are used. The roughing wheel is driven by a 100-hp. motor mounted on the rear of the head and driving to the right-hand end of the spindle through multiple V-belts. Machine weighs 195,000 lb., including all electrical equipment. In all, thirteen electric motors, totalling 224.5 hp. are used. Wheels can be changed on the roughing carriage or the finishing carriage, while the other carriage is in use. **(21)**





Niagara Series SL Squaring Shears

A line of Series SL power squaring shears has been announced by Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. These shears are built in 6, 8, 10 and 12 ft. lengths for flat shearing $\frac{3}{16}$ in. steel. They are also available in 14 and 16 ft. lengths with a capacity for No. 10 gage steel. The triangular section crosshead has a low slope.

Inclosed drive is mounted on anti-friction bearings. Design includes a fourteen-point-engagement, sleeve-type clutch, similar to those previously applied to the Master Series A punch presses announced last year. A built-in, single-stroke mechanism is provided. This mechanism can be disengaged by turning a knob at the back of the machine. Niagara alloy-steel knives are furnished as standard equipment. **(22)**

Pettinos "Sonittep" Castable Insulation

Suitable for temperatures up to 2,000 F., "Sonittep" castable insulation offered by George F. Pettinos, Inc., 1206 Locust St., Philadelphia, Pa., requires no reinforcement and is claimed to withstand shocks and vibration. It is suitable for casting light doors in heat-treating and annealing furnaces, for complete annealing furnace insulation, and for insulating forge furnaces and ovens. It can be cast in heavy sections around pipes and fittings, but must not be applied to a hot surface. The surface must be cold and the cement allowed to stand 72 hr. before heat is applied.

This material is usually poured to a depth of about three-quarters of the total thickness of the lining, and while the castable insulation is still damp, "Sonittep" refractory can be poured on top to complete the thickness of the lining. The entire mass is said to dry and knit together, forming a monolithic lining, free from any joints. **(23)**

Quigley "Insulblox" Block Insulation

Reduced heat storage and radiation losses at operating temperatures up to 2,200 F. are claimed for "Insulblox," a light-weight, low-heat storage refractory block insulation announced by Quigley Co., Inc., 56 W. 45th St., New York, N. Y. It is made from a highly stable, calcined, fire-clay base material with thin-walled minute cellular structure. The material can be directly exposed up to 2,000 F., and will withstand up to 2,200 F. interface temperature.

It is not necessary to cement this material, as it may be laid close together over roofs and arches or set into place behind brick work in furnace walls. "Insulblox" are easily cut or sawed to make special shapes to fit around steel work. Easy handling is insured by the light weight of approximately 30 lb. per cu. ft. It is furnished in thicknesses from 1 to 6 in., and in sizes from 6 x 36 in. to 12 x 36 in. **(24)**

Milne Color-Coded Tool Steel

Positive and ready identification of the grade of tool steel in hand is made possible by a system of color coding adopted by A. Milne & Co., 741 Washington St., New York, N. Y. Eighteen varieties of tool steels, from carbon tool steel to super high-speed steel, are completely sprayed for the entire length with an individual, identifying color. Customers and jobbers will be supplied with a color chart, which is printed in the actual colors, and which tabulates forging, hardening, quenching, and drawing information for each of the steels.

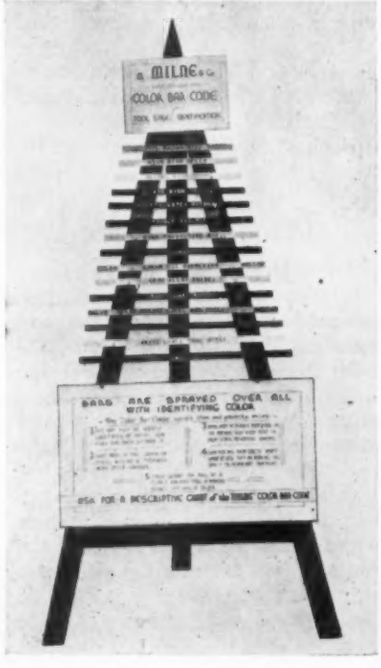
Several advantages accrue from using this color coding system:

1. Stock clerks, even though inexperienced, cannot mistake the grade of steel. No matter how much has been cut from the bar, the stub still has the identifying color. There are no labels to be lost or identifying marks on the ends to be cut off, and thus lose identity of the remaining piece.

2. Stock clerks can judge almost instantly how much material of a given kind is on hand. Inventories can be taken at a glance and fast moving steels re-ordered before the supply is exhausted.

3. In small shops different grades of steel may be kept together on the

Display racks for Milne color-coded steel show the types of steel available and identify the kinds by the color of paint sprayed on the entire bar



same rack without danger of mix ups with resultant losses.

4. By removing possibility of mistakes in the issuance of material, lost time and labor in the shop, and spoiled tools, are prevented.

5. Cut pieces delivered to the shop carry the identifying color until machined. Where all of the color is not removed in machining the part is readily identified to the heat-treater.

6. Material may be sent out to forge shops or other specialists without chance of mistakes because an identifying chart will be used there also. These outside specialists can also tell at a glance how much material is on hand and thus estimate how soon a new supply must be obtained from the customer.

7. The heat-treater can follow correct heat-treating procedure, without possibility of mistakes, knowing by the color what the steel is.

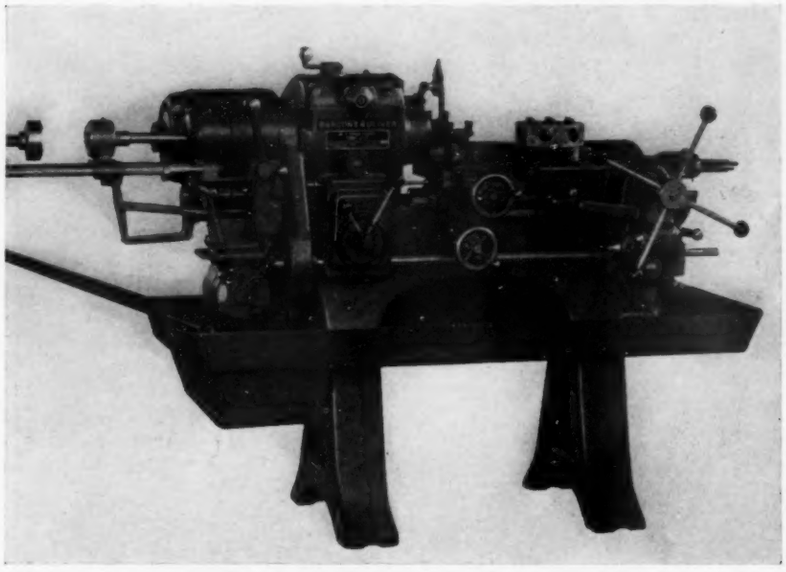
This color coding system is being applied to eighteen different tool steels, including bars, hollow die steels and tool bits. In the case of the tool bits the color will not wear off and the tool maker or machinist can regrind tools a number of times without losing the identify of the tool steel involved. Furthermore, tool bits can be returned to the tool room for sharpening, and the correct grade of high speed or carbon steel will be always handed out. **(25)**

"Ebonized" Monel

The International Nickel Co., Inc., 67 Wall St., New York, N. Y., announces production of "Ebonized" Monel, with an ebony finish designed for use where appearance, must be maintained under temperatures up to 1,400 F. This material is identical with standard Monel, except that a lustrous "blue-black" finish is imparted by oxidizing. **(26)**

Trane Four-Blade Propeller Fan

Designed for quiet operation and high efficiency, a four-blade propeller fan is announced by the Trane Co., La Crosse, Wis., for incorporation in Trane unit-heaters and unit-coolers. These fans are built with four curved steel blades of large area set at an agle of 30 deg. with the plane of rotation. Curvature of the blades is formed to insure the leading edges entering the air stream without shock. Wide tips provide for gradual acceleration of the stream. **(27)**



Bardons & Oliver No. 2 Geared Electric Turret Lathe

Design of the head of the No. 2 geared electric turret lathe centers about a standard frame, high torque, quick-reversing motor. Offered by Bardons & Oliver, Inc., 1133 West Ninth St., N.W., Cleveland, Ohio, this turret lathe has capacity for a 1-in. diameter round bar through the spindle and is claimed to be especially suited for the machining of brass, aluminum and other non-ferrous materials, as well as steel and small cast-iron castings. Reversing is accomplished electrically.

Spindle has an American standard 6-in. spindle nose and can be equipped with standard hand- or air-operated chucks. Six spindle speeds are obtainable with a single-speed motor, twelve with a two-speed motor. In addition, speed ranges may be varied by employing different sets of gears in the head. Loss of time in shifting gears is eliminated by the use of a single lever, conveniently located on top of the head. A hand lever conveniently located in front, directly below the head, controls the electric reversing.

Turret slide has an effective motion of 7 in. relative to the saddle. Saddle apron provides six power feeds to the turret slide, ranging from 0.0035 to 0.033 in. per rev. Feeds are changed by a simple motion of a single lever and are read on a large dial. Three different cross slide and carriage units are available. A hand screw feed is provided when the machine is to to be used for average work, such as facing and cutting-off steel or cast iron. For high-speed operation on the softer non-ferrous metals, a lever feed cross-slide is used. A combination unit, offering both types of feed, gives the operator the chance to select the type that is most suited to a particular job. Longitudinal motion is obtained by rack and pinion. Two hand-operated, bar-feeding mechanisms are available. With the ratchet type, the bar is supported in a 2-jaw chuck and the supporting head slides concentrically with the spindle on two horizontal, parallel bars. For small sizes of stock turned at high speeds, the finger bar feed is claimed to be more suitable. **(28)**

Botfield Refractory "Adachrome-Cast"

Botfield Refractories Co., Swanson & Clymer Sts., Philadelphia, Pa., offer "Adachrome-Cast" for forming monolithic hearths in all types of heating furnaces. This high-temperature castable refractory can be used for repairing reverberatory furnaces, as well as for pouring monolithic hearths in forging and heat-treating furnaces. Recommended normal firing range is between 2,000 and 3,400 F.

It is rapid setting and is claimed to have high structural strength and good bonding characteristics throughout its complete range. **(29)**

What Should a Modern 30-In. Lathe Be?

A. W. FORBES
Forbes & Myers

This question has forced itself upon my attention, because our equipment is getting old, and one of the first machines we should get is a 30-in. lathe. This discussion may be based too much upon the conditions in one shop, but these conditions cannot be unique, and if others should want to answer the question from another point of view that would be welcome.

The first thing to do, in using a lathe, is to get the piece to be turned into the chuck or between the centers. Overhead hoists are crude things for this purpose, often requiring two or three men to do the work of one. Putting the piece into the lathe is a specialized job that should be done with specialized equipment, built as a part of the lathe. I would suggest easily adjustable clamps, made as part of the carriage, which would swing down at the rear and be fitted over any ordinary shaped piece to be turned. These clamps should then swing the piece up by means of power from the lathe and over into line with the centers. The usual carriage feed would then bring the piece directly on the center. Perhaps the lathe manufacturers have a better way, but mention of this important feature is conspicuously absent from their advertisements.

Next we must have means for holding the tool. Can anyone tell why the tool should be placed directly in front of the centers? Is there any place where the tool and its supports would be more in the way than directly between the operator and his job? Is there any place where it is harder to give the tool a rigid support than at the maximum distance in front of the ways and well elevated above them? The obvious place for the tool is at the nearest practical point to the ways, a place where rigidity can be secured without excess weight and bulk.

Removing the tool from its traditional place would also permit the removal of another objectionable feature, the obstruction that the carriage makes to the use of the full capacity of the lathe. A 30-in. lathe is the right size for turning a 30-in. cylinder, but because of this obstruction it is necessary to use a 40-in. lathe, which is too bulky for convenience.

The next feature that would serve to induce me to get some modern equipment is a set of conveniently operated, accurate automatic stops. Much of the time of the operator is now spent in returning to the lathe when the cut is but half or two thirds done, because of the harm that will result from a failure to stop it at just the right time. Modern equipment should avoid this waste of time.

The power must be adequate for reasonable cuts. A few years ago I thought that more power should be one of the requirements of a new lathe, but further experience has led me to question the value of excess power. At present our heaviest lathe is driven by a single 2½-in. belt, and I am inclined to question the economy of more power for a lathe of 30-in. swing or less. That may be rank heresy, but I cannot figure any saving. The only gain from heavier or faster cuts is the saving of machine time. In every other respect the more power-

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ful machine increases cost. If automatic stops are used so that the operator need not give the machine any attention until it stops, the more rigid set-ups make the total man time per piece greater for the more powerful machine, and the labor must be more skilled and presumably higher paid. The more powerful machine requires heavier tooling. No one is going to sell me a new lathe on the basis of its having more power.

Of course the lathe should be accurately made and have good bearings and lubrication, but these are features so generally found that they no longer are selling points. Other common features such as compound rests, taper attachments, thread cutting screws and gears, geared-head drive are minor items. They might be considered in choosing between good machines, but would not induce us to replace old equipment.

The question which we must face, as all others must who are contemplating new equipment, is whether the modern lathes contain enough of the desired features, such as those mentioned above, to warrant the extra cost of replacement.

Drill Heads in the R.R. Shop

Multiple spindle drill heads are finding a place in the modern railroad shop, as can be seen in Figs. 1 and 2. The first is drilling the ends of truck brake pins in a simple fixture. A separate hand screw fastens each pin in place but all four are drilled at once.

Another use of the same drill head is seen in Fig. 2. Here longer brake pins are being cross drilled at the ends for cotter pins. The fixture has adjustable outer supports by which the location of the cotter pin hole can be accurately gaged.

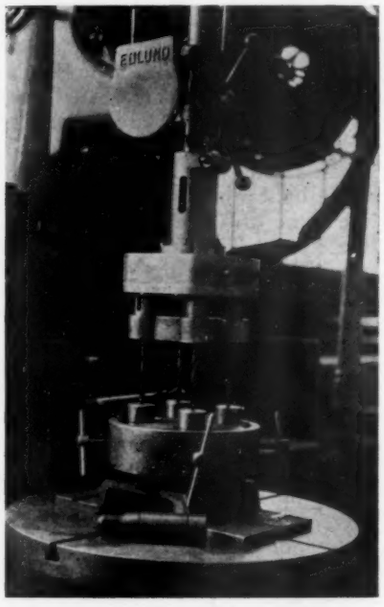

Fig. 1—Drilling the ends of truck brake pins in a simple fixture. A separate screw fastens each pin in place

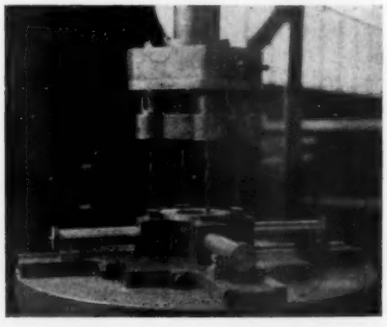

Fig. 2—Longer pins are being cross drilled for cotter pins

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The stop pin at the left of the outer support fits into holes in the base of the fixture. They are drilled to suit pins of different lengths and obviate the necessity of measurement when changing from one length pin to another.

Safety and the Foreman's Responsibility

Accident control is a problem in management just as financing a company and providing its physical equipment and raw materials is a management problem. The administration which does not accept accident prevention as a production problem has not reached the stage in accident prevention work to be interested in the responsibility of the foreman.

It must be recognized that responsibility rests entirely on the question of jurisdiction. The foreman as a major supervisor in an organization for manufacturing goods has the responsibility of the achievement of production and the safety policy of the management.

In order to place the responsibility of the foreman in accident prevention, it is necessary to understand his authority and jurisdiction in the organization of which he is a part. Following is an example of the limits of jurisdiction of the foreman in certain shops:

1. The foreman either actually employs his own help, or interviews the applicant, who is only employed on his recommendations to the superintendent or employment manager. This puts him in control of placing the man in the proper job according to his fitnes. If, for example, heavy lifting is required, he can request a physical examination.

2. He has complete charge of the cleanliness of his department unless the clean-up work is done after hours by a separate gang. In this case there is no cause for criticism as far as departmental accident occurrences are concerned.

3. He may discharge employees for undesirability, incapability, or violation of instructions.

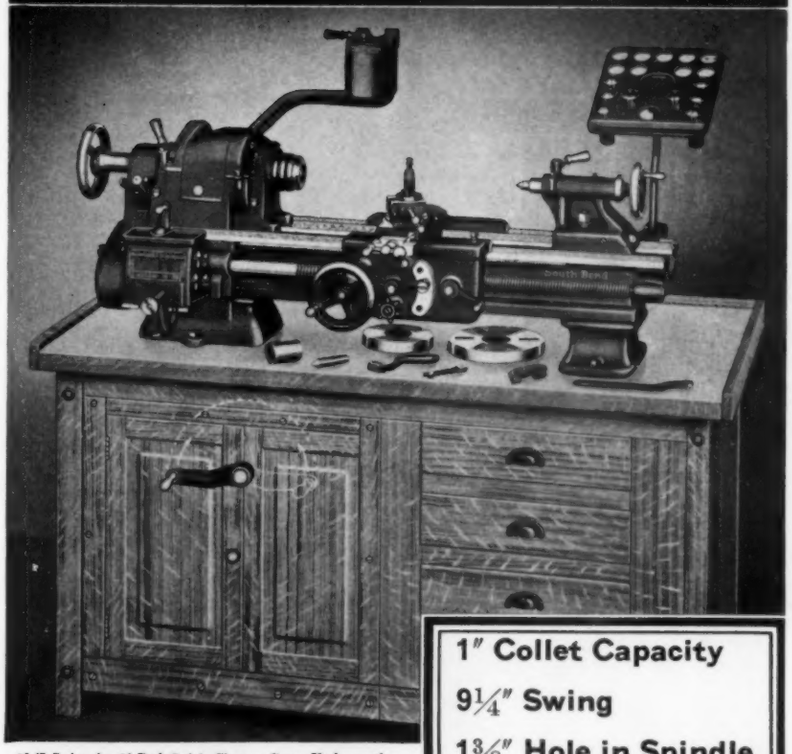
4. He supervises the instruction of all new employees in their duties, operating rules, cautions them against hazards pertaining to damage to material or equipment. If there are apprentices, he is their master.

5. He will report all items requiring repairs or adjustments on machines and equipment, flooring, runways and strairs, broken or weak ladders and scaffolding, broken windows, elevator gates broken or out of order, and all other items under the jurisdiction of the master mechanic.

Given the almost absolute operating jurisdiction indicated above, jurisdiction in accident prevention is identical. Curtailment of his operating responsibilities implies a similar curtailment of his accident prevention responsibilities. A man cannot be expected to accept responsibility where he is not allowed jurisdiction. Having developed a reasonably uniform idea as to the foreman's responsibilities, it is necessary to establish the way in which these responsibilities may be met. A good foreman is a leader, not a driver. He achieves success largely through the cooperation of his fellow workers. Cooperation is only accorded him when the employees recognize:

1. His interest in their welfare;
2. His desire for suggestions for them;
3. That he will not hesitate to dis-

New South Bend 1" Collet Lathe



9¼" Swing by 3' Bed Quick Change Gear, Underneath Belt Motor Drive Bench Lathe complete as shown above, with Draw-in Collet Chuck, 8 Collets, Collet Tray, ½ H.P. Motor, and Electrical Equipment. Wt. 680 lbs. f.o.b. factory..... $656.50

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THIS new 9-inch lathe is a back-geared Screw-Cutting lathe with all engine lathe features, and is recommended for the manufacturing plant and the tool room. Draw-in Collet attachment available in Hand Wheel Type and Quick Acting Lever type. Six tool bed turret and Double Tool slide adapt lathe to multiple operation manufacturing jobs. Telescopic Screw Type Taper Attachment and other attachments also available.

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Catalog No. 97 illustrates, describes, and prices the new 9-inch South Bend Large Spindle Hole Lathe in Underneath Belt Motor Drive, Pedestal Adjustable Motor Drive, and Countershaft Drive Types, and in 3', 3¼', 4', and 4½' bed lengths. Copy sent free, postpaid.

SOUTH BEND *Precision* LATHES

cipline recalcitrant workmen who endanger their fellow workers;

4. His own obedience to plant rules;

5. That the rules have been formulated to help, not hinder, production and earning power;

6. His unfailing impartiality in his relations with fellow employees.

For plant rules to be effective, they must be specific and each rule should cover only one particular item. If many hazards are to be covered, separate rules for each should be made. Additionally, of course, all rules must be carefully scrutinized for practicability. The foreman's jurisdiction is specific and each rule must fall within that scope if he is to be held responsible for its enforcement.

As we expect a foreman to produce good work because of his basic knowledge of its production, we must teach him to prevent accidents by knowing what causes them. This information can be gained from the experience of others as shown in printed accident prevention material available. Safety conferences are another source of knowledge.

Not only accidents which involve personal injury, but all unusual happenings should be studied. The foreman should examine each "unexpected event" in his department regardless of the personal injury effects. Classifying accidents into two groups of mechanical and non-mechanical, is not sufficient for placing responsibility of accidents. If accidents are classified according to whether they were caused by physical conditions or by unsafe practices, the responsibility of the foreman can be fixed. Given working conditons which have been made as safe as is humanly possible through suitable equipment, proper safeguards, plant layout, adequate light, the foreman is responsible for safe practices.

The foreman can prevent accidents. His job is to control the help in his own way. A good foreman knows no limits of accomplishments in securing obedience to his instructions. On the foreman, then, must depend the best results in accident prevention.

Abstracted from talk given by Everett A. Roberts, district engineer, American Mutual Liability Insurance Company, before North Carolina Safety Conference, Winston-Salem.

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Scientifically heat treated to a true spring temper, "Rivett Mark" collets resist wear and hold their spring longer than collets of any other make. As standard equipment on all makes of lathes and millers, (see Rivett Bulletin 100B) they may be ordered for immediate delivery from the following stocks:—
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Drills a Mile Long

Deep hole drilling is always a problem in metal or other materials. The oil fields offer no exception, but many other difficulties crop up such as the weight of the pipe which drives the drill and the torsion in the pipe when the length runs up into thousands of feet.

The driving head of such a drilling rig is seen in Fig. 1, which shows how it gets power from an engine or motor at the rear. The lower end of the drill head is shown in place. This is shown separately in Fig. 2. The coned head has keys that fit into the geared upper plate and drive the drill.

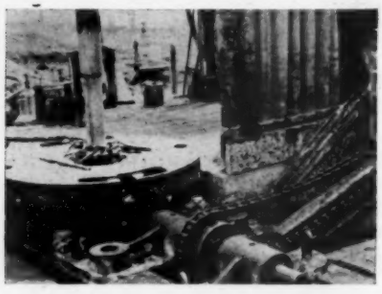

Fig. 1—A motor at rear powers the driving head of the rig

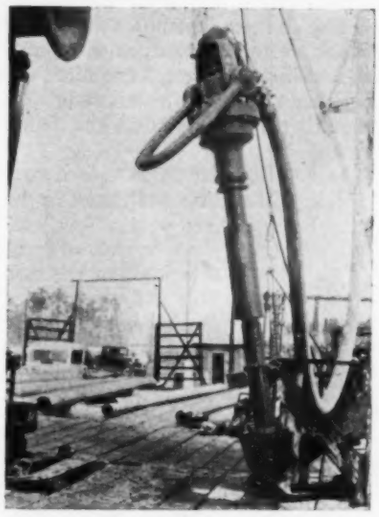

Fig. 2—Keys in the coned head fit into the geared upper plate

At the upper end is a shackle by which the weight of long lengths of 6-in. pipe is taken from the drill by a crane or hoist. The weight on the drill must not be too great or it cannot be turned. The water hose permits the dirt to be washed out from the casing as the drill goes down.

Fig. 3—Huge pipe tongs are needed to screw sections together

Drill tubing comes in lengths of about 30 ft. that can be handled without too much effort, but each joint must be screwed and unscrewed as the drill goes down or is pulled out. This of itself is no easy job and some idea of it can be had from the size of pipe clamps, or wrenches used, as in Fig. 3. A drill, with its threaded taper shank, is shown on the floor under the wrench and beyond the pipes. These pipe clamps are supported by slings as can be seen, a jib crane making it comparatively easy to move the clamp as needed.

These views are from a new oilfield in Florida and, at the time these views were taken, the hole was 6115 ft. deep. Using drills over a mile long is outside the shopman's sphere.

Independent Unions

After eight months experience with an independent union, the management of a medium sized machine shop in a small manufacturing city is unanimous in its opinion that a recognized national union would have been much more satisfactory to deal with.

Eight months ago when a wave of organization swept over workmen everywhere, organizers of a national union paraded in front of this shop. But the workmen asserting an inborn independence would have nothing to do with these organizers. Recognizing a need to organize they created their own shop organization.

In all the years this plant has been running there have been no unions. The workmen were not versed in organization procedure. They believed that by organizing whatever they requested would be theirs. In other words they could have their own way.

They immediately set out to secure their own way. This plant always had plenty of work and because

BLAKESLEE DEGREASERS AND BLACOSOLV

for thorough

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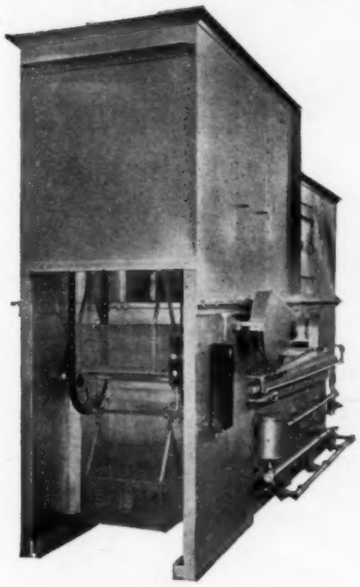

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The Blakeslee Degreaser provides for the most economical use of this solvent. Of scientific construction and backed by a perfect understanding and knowledge of metal cleaning problems, the Blakeslee Degreaser comes in all models and phases so that our trained engineers can give you the correct machine for your job.

Shown here is an automatic basket type degreaser of smaller construction. It is used for heavy departmental cleaning production. "Baskets load and unload at one end of the degreaser, as shown above."

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skilled machinists were scarce, they worked 50 hours a week; nine hours per day and five hours on Saturday morning. At one of the first meetings of the new organization they demanded a 45-hour week with 50 hours pay. Prior to this time the men had been receiving the prevailing wage scale, and this proposal would boost their rate way above normal.

The management resented this proposal because they had done their utmost to keep the men busy and to meet the prevailing wage rate. After considerable negotiation the men agreed to a ten per cent increase and a 45-hour week.

Immediately the men asked for time and a quarter overtime above the 45-hour week. This was granted. Then came up the question of holidays. The men repudiated their previous agreement that 45 hours constituted a normal work week and demanded that when a holiday came within a workweek they be given an opportunity to work on Saturday at time and a quarter.

The independent union then tried to dictate to the management who it should hire and fire. It mattered not whether a man was incompetent. He shouldn't be fired unless the union agreed.

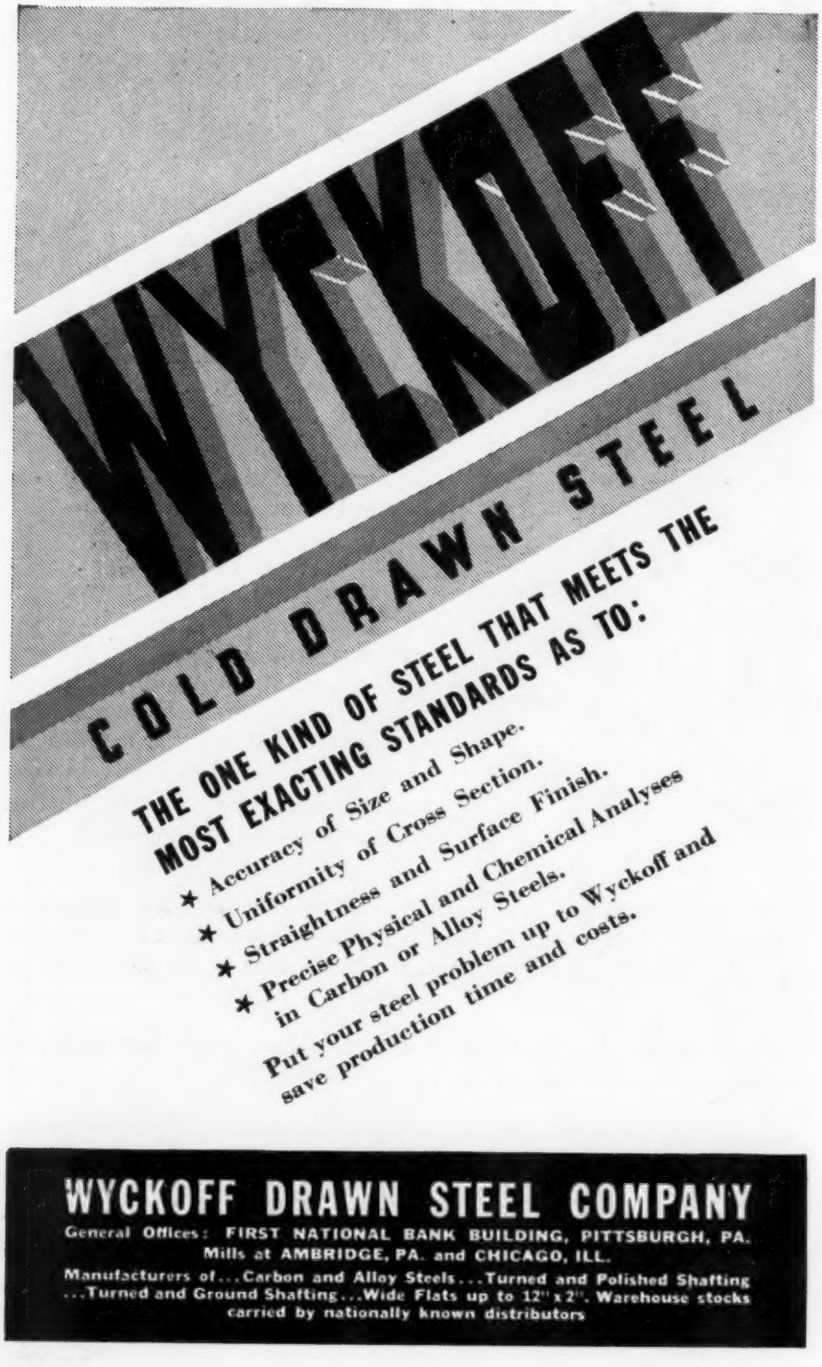
In addition the union caused considerable ill feeling and unrest in the shop because there were a few level headed workmen not entirely in favor of the dictatorial attitude of the new union. As a result the efficiency of the plant has been lowered.

The management has placed its problems before the union representatives but they have failed to see the situation from the manufacturer's standpoint. The management has tried to explain that they cannot pass along increased labor costs to the customer. It has tried to point out that they should not be penalized by paying time and a quarter when they give a man an opportunity to make up lost time.

If the officials had an opportunity to deal with seasoned labor officers who know both sides of the economic picture much better feeling would have resulted in the plant and the management's labor costs would not have risen so sharply. It would have worked out to the benefit of the workmen and the company. There must always be a balance wheel so that goods can be produced and sold in competition with other like goods. Labor should receive its just share. But when labor asks too much it is just as bad as when capital requests more than its share.

This shop in question is now faced with two alternatives: the first, now that the hourly rate has been increased more than normal it is possible to secure additional workmen. The company can put on a night crew and eliminate all overtime. Or secondly, it can let some of its work out on contract and eliminate overtime.

After eight months experience with an independent union it would seem that a national union would have been far better for this medium sized plant.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Rustless Benches

Shop benches covered with rustless iron or stainless metals are a novelty in most places. This has been done to all the benches and desks in the inspection department of the Gould & Eberhardt shop and the innovation is not only striking, but pleasing in the extreme. There is no glare, as from a reflecting

mirror, but rather an attractive, semi-bright surface that denotes cleanliness without disturbing the eye.

Wear of Metals in Textile Machinery

To reduce wear to a minimum the efforts of the textile-machinery manufacturing industry have been directed toward improvements in design, in finish, and in the materials used. From the standpoint of design, mechanical changes have been made in the interest of reducing shock loads, increasing bearing areas, providing more accurate assembly, improving running fits, providing locking devices to eliminate mal-adjustment resulting from vibration, and making provisions for better lubrication. The last-named item includes the proper placing of oil grooves and lubrication fittings as well as the selection of suitable lubricants.

The question of machine finish has a direct bearing on wear. Years ago textile machinery was made largely in the foundry. Few parts were machined in such a manner as to be interchangeable, primarily because the design of the product did not lend itself to the use of machine tools in their manufacture. The result was that the parts in many instances were rough and did not fit accurately, hence the best conditions for limiting wear were not present. Now, however, through new designs and the use of new machine tools, the parts are assembled more securely and accurately, and have finished surfaces at the points where relative motion takes place. Materials have been studied to the end of increasing the life of machine elements.

Textile machinery was originally made 90 per cent of cast iron. Modern textile machinery still includes a large amount of this material, but its amount in proportion to other materials has decreased markedly in favor of a few cast-iron alloys and steel of various grades.

It is fair to say that two-thirds of the parts in a modern loom, or 600, are subject to wear. A detailed analysis of the components of a modern and an obsolete loom show that an average of 7.36 machining operations per piece are required for the new machine as compared with 5.24 machining operations per piece in the old machine. In other words, there is 40 per cent more machine work done on the new equipment than there was in that of older design.

A large part of this work is grinding and reaming. There are about three times as many grinding operations and four times as many reaming operations in the new as compared with the old designs. This in itself indicates that friction and wear have been minimized.

The main bearings of weaving machinery are of two kinds—plain and anti-friction. Years ago only the former were employed. A bored and reamed gray-iron casting served as the box in which a turned shaft ran. No specific fit could be maintained because, despite all manufacturing tolerances, the bearings of necessity were line reamed on the assembly floor. That was the only method by which inaccuracies of hand fittings could be overcome. Modern textile machinery demands accuracy, not only when the machine is new but throughout its life. Loose-fitting bearings are not tolerated. A modern machine for fine high-quality goods must have shafting that turns freely with clearances that range from 0.0015 to 0.005 in.

Such accuracy can be maintained

only by increased bearing areas, by improved finish, and by better facilities for lubrication. In modern looms there are more and larger bearings than in looms of an old design. The bearings are closely machined, the shafting is centerless ground and oil grooves are located properly on the low-pressure side of the bearings and supplied from wick-feed oil cups.

Abstract from a paper by Albert Palmer, Crompton & Knowles Loom Works, and delivered before the "Symposium on Wear of Metals," sponsored by the American Society for Testing Materials.

Working Hours

Evidence that factors other than mechanization and working hours are responsible for today's unemployment is cited in a pamphlet "Machines and Working Hours" recently published by Machinery and Allied Products Institute. This pamphlet shows that in the construction industry, where hours are among the shortest, employment is only 55 per cent of the 1929 level, compared to 99 per cent for all employment. Pictorial graphs also show that industries which have increased mechanization most since 1919 have increased employment most.

The American standard of living is closely linked with the amount of work done in the country, and mechanization makes it possible to do more work in less time, thereby raising the standard of living. When less is accomplished by working less, the nation as a whole suffers by having fewer goods and services to enjoy.

Had working hours been reduced as fast as output per man-hour increased since 1899, the work week today would be 23 hours, but the standard of living would be no higher than it was in 1899. Had there been no increase in mechanization since 1899, a 94-hour week would be required for today's factory workers to produce the goods necessary for the current standard of living, instead of the 40-hour week now enjoyed.

There may be sound arguments for general reductions in working hours in American industry, but the facts do not indicate that industrial mechanization is one of them. If mechanization creates more jobs than it destroys, which all of the facts indicate that it does, it is not logical to assume that it is the cause of today's unemployment.

Factory employment today is 83 per cent above the 1899 level, when little machinery was used, and population is only 72 per cent above the same level. Although yesterday's work could be done in fewer hours today, the manufacturing industries produce such an increased volume of goods that man-hours in the first half of 1937 have been 29 per cent above the figure for 1899.

Although it has been possible throughout American industrial history to reduce working hours from generation to generation, the work week is now being reduced out of all proportion to increased output per worker. Working hours have been reduced more since 1929 than in the thirty years preceding.

In general, history shows that employment per unit of finished product has declined, but today many industries which are placing emphasis on quality rather than quantity show higher employment per unit of production than they did eight or ten years ago. In 1936, for instance, 9.8 automobiles were produced for each man employed in automobile manufacturing as compared to 12 in 1929. Employment per dollar of finished product was 28 per cent

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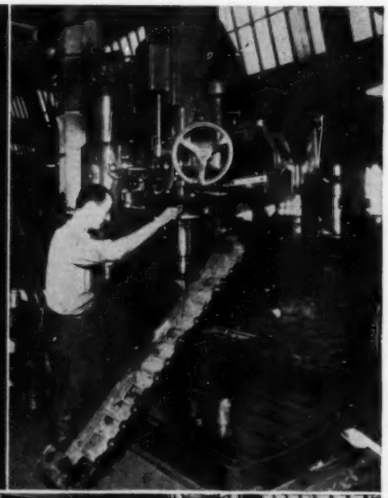

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The close-up view shows one of the Cincinnati Bickfords performing the following operations on a gray iron brush housing for an automatic bottle washing machine:
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higher in 1935 than in 1929 in all manufacturing industries as a whole.

Machinery affects the manufacturing occupations most, yet employment in manufacturing industries in June, according to National Industrial Conference Board figures, was five per cent above the 1929 average; whereas in the non-manufacturing industries, where technology plays a much less important role, employment was three per cent below the 1929 average.

Age and Jobs

You have probably observed in the merry round of questions and charges being hurled about, that few of them stand still long enough to be threshed out or answered. There is technique in that. Swinging swiftly from point to point, pausing nowhere to risk being silenced, a confusing barrage is more effective for propaganda than plain discussion of facts could be. It helps to produce the impression that the questions and accusations are unanswerable. But the range of these is limited, their recurrence is regular, and no one should find it very hard to get their measure.

Take the question of a man's age and his job. The report is diligently circulated that men of a certain age are refused work, that employers conspire to make men of 45, or more, obsolete. Without proof, without evidence, the notion is nonetheless current that the practice prevails whether by agreement or not.

The fact seems to have escaped general notice that in this country employment of persons of 45 or older has been on the increase for 30 years. In the year 1900 the census showed that 20 per cent of all employed persons were 45 to 65 years old; the last census increased that to 25.4 per cent. Employes 40 to 65 years of age comprised 23 per cent of the total in 1900, and rose to 35 per cent in 1930. That is, increased employment of the older age groups favorably affected 2,500,000 persons. These are the government's employment figures for the entire nation. The picture is somewhat changed in specific industries. In the Ford Motor Company, for example, the percentage of employes from 40 to 65 years of age is higher than it is or ever has been for the nation at large. The nation's highest employment in this age group has been only 35 per cent of total employment—in the Ford factory it is 43½ per cent. This is the more remarkable because "heavy industries" in "manufacturing" provide only 13 per cent of the nation's total wage-earning work. Running over some daily reports, we found that of the last 697 men more than 40 years old, hired by the company, 207 were more than 50 years old, four were 65, six were 66, and four were more than 70. There is a reason for this, just as there may be a reason for what seems to be the opposite practice in other places, and these we shall discuss later on.

This question of age and jobs did not exist a few years ago—what gives it prominence now? Well, the answer is, the new prominence of older people able to work, and their greater concentration in industrial centers. More persons live longer than formerly, and our older men are younger than they used to be. People not only live longer, they age more slowly. If you find this difficult to believe about men,

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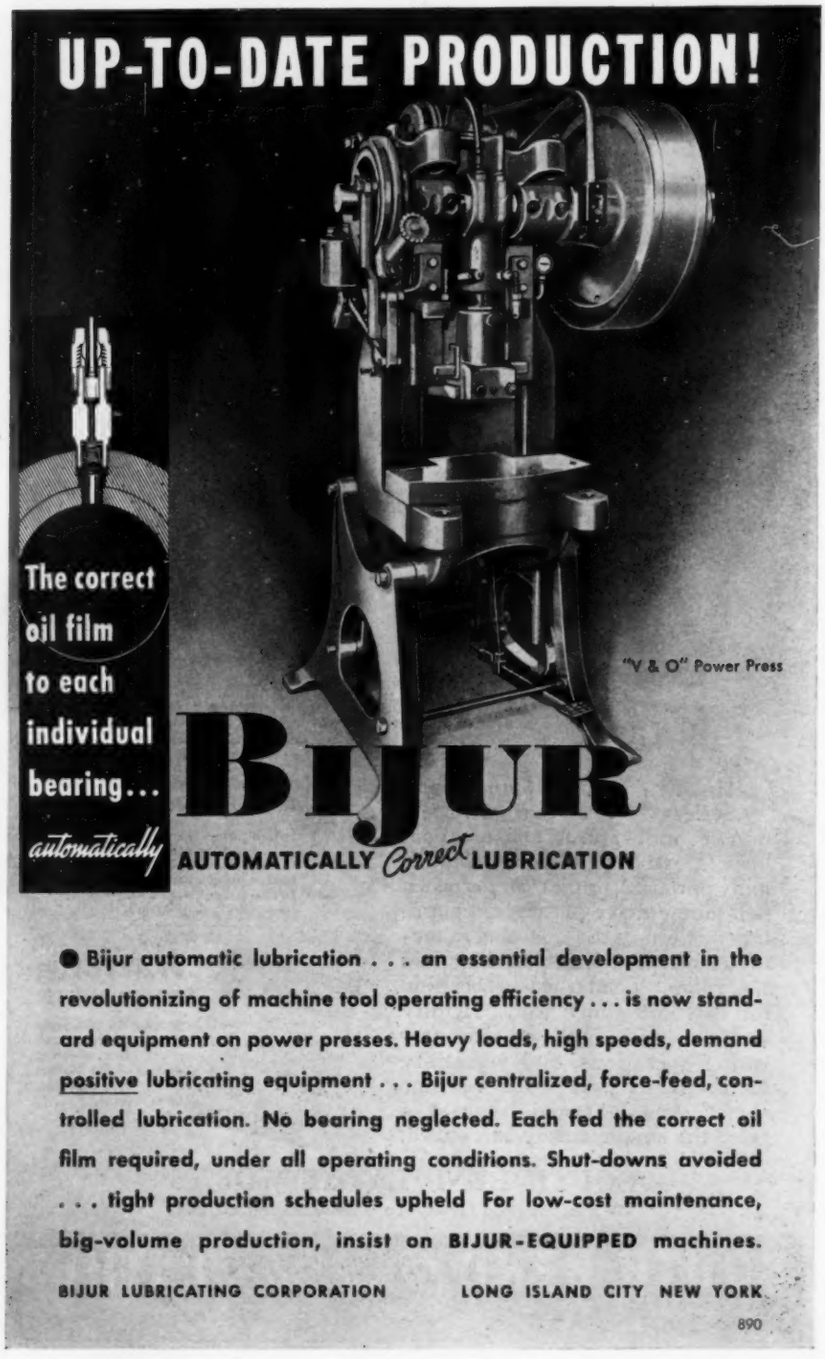
A large share of responsibility for creating this problem of age and jobs must be laid at the door of industry. A generation or two ago, when workers were under much longer and heavier strains, everybody—not the factory worker only—everybody at 50 was pretty well used up. But by lifting the burden off men and putting it on machines; by special attention to safety, lighting, ventilation, medical supervision, thus creating healthful working conditions, by reducing the workday a third and the work-week 44 per cent; by doubling and trebling wages and refining the standard of living, and doing these things of its own initiative, in obedience to the necessities of its own progress, modern industry has helped to preserve the prime of average working life to 50 and beyond. If industry wore men out as cruelly and as rapid as uninformed literary and political critics say it does, there would not be today any problem of older men looking for work. Industry itself has helped to create this condition by lengthening the period of employability. Tomorrow morning 19,000 men will walk into the Ford shops who have worked there 15 to 30 years. Of these, 5,600 have worked there more than 20 years, and hundreds will walk in who have worked in the shops more than 25 years. In fact, 22 per cent of Ford employes have had more than 15 years of service; there would be many more had not large numbers left voluntarily after achieving by their employment the means to fulfill other plans they had for life. These facts confute much misinformation concerning the effects of modern progressive industry upon its men.

From a radio broadcast by W. J. Cameron, Ford Motor Company.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Die-Hole Layout

MALCOLM R. BANTON
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As a constant and enthusiastic reader of your worthy publication, I take exception (I should say, we take exception, my fellow readers of your magazine included) to the remarks in Charles Weslow's article (*AM*—Vol. 81, page 994): "If you can't observe any difference, then you can't read a vernier to within a half a thousandth. Any toolmaker who can't do that, shouldn't be a toolmaker. He should be a pretzel maker, which is about as accurate as the wag of a dog's tail."

The whole paragraph is superfluous and ridiculous; its omission would have conveyed a clearer understanding. When a man's vision becomes impaired it does not necessarily follow that his intelligence also becomes impaired. We have many men in our organization who, after long years of tedious and delicate work, find it necessary to resort to the use of a magnifying glass—such men are still productive of good workmanship.

Men of declining years have a

hazardous road to tread in the matter of securing employment, and men in such circumstances certainly need no coals heaped upon their heads. Realizing that your paper is read by thousands of industrial executives, some, of course, may be gullible enough to swallow such propaganda and thereby make it a little tougher for the fellow who is already handicapped.

Micro-geometry

We've been thinking and talking a lot about standards for surface finishes, without getting very far toward a solution. Perhaps the most practical standards to date are those set up in individual shops to meet their particular needs. These usually consist of a number of different samples with different degrees of finish, each with a number or letter for reference. This is a purely comparative method depending on the judgment of the one who decides which is which.

As a basis for actual measurement of surface irregularities a German physicist, G. Schmaltz, proposes "micro-geometry" as a basis, this meaning the size and shape of irregularities. The depth of scratches (for want of a better name) can be measured by the light-slit method, on cylindrical work, and plotted so as to show the average.

The effect of surface defects vary from that of mere appearance to the ability to hold lubricants, the pressure needed in force fits and also as affecting the life of a part subjected to stress. Even minute scratches may start fatigue failure.

Making Screws Fit Tight

FRANK C. HUDSON

C. A. Mowrey (*AM*—Vol. 81, page 1043) gives a practical argument for the use of "jam" fit screws where good fits are wanted. This has been advocated many times, the late Chester B. Lord being an ardent sponsor of this method. For cases such as mentioned by Mr. Mowrey, and many others, this method is much more sensible than attempts to secure the close tolerances given in some of the tables of screw thread fits. It may not sound scientific, or in keeping with modern accuracy of machining, but it is much more economical to use the "flow" properties of metals than to spend time on increasingly close tolerances.

NEW BOOKS

CEMENTED CARBIDES IN THE MACHINE SHOP. (*Hartmetalle in der Werkstatt*) *By F. W. Leier, No. 62 of the "Werkstattbucher" Series. 54 pp. 6x9 in. 128 illustrations. Paper cover. Published by Julius Springer, Berlin. Price 2 R.M.*

Cemented or sintered carbides have been known for over ten years under various names, such as (in Germany): "Widia," "Titanit" and "Boehlerit"; (in the U. S. and England): "Carboloy," "Vascoloy," "Ramet," "Diamonite," "Firthite," "Firthaloy," "Straus Metal" (Tantalum Carbide), etc. Their use can be divided into three classes: (a) As cutting tool material; (b) as a die material, and (c) as a wear and corrosion resisting material. The present booklet deals mainly with the use of cemented carbide cutting tools (the three German brands named).

Cemented carbide products are nonferrous in character and are cus-

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tomarily produced by mixing powdered constituents, consisting of one or more metallic carbides, with a binding material having a lower melting point. The mixed powders are pressed in steel molds of the proper shape under hydraulic pressure ("powder metallurgy") to be used, for example, in the form of tips welded onto the end of heavy steel shanks.

Cemented or sintered carbides cannot be forged or heat treated. They are less ductile than high speed steel and serve best when cutting materials which are abrasive in character. They must be ground with less clearance and rake so as to provide a greater lip angle to support the cutting edge. They should be supported rigidly so as to avoid bending or chattering.

To facilitate handling and forming, the pressed pieces may be "presintered," in which condition they can be shaped with steel tools. After such shaping, final hardness is obtained by heating to a higher temperature. Both sintering operations are made in a furnace having a non-oxidizing atmosphere.

Twenty-six tips for various types of tools commonly used in machine shops are illustrated on pages 9 to 17 of the booklet. The necessary dimensions (in millimeters) are tabulated, and the various angles to which the tips must be ground are shown on the sketches.

The following is a partial list of the many types of tools that are being tipped with cemented carbide:

Single point turning., boring, facing, chamfering, and planer tools.

Grooving tools for straight and form grooving.

Form tools—flat and circular.

Blades for inserted tooth milling cutters, adjustable reamers, saws.

Drills, both flat and spiral.

In addition, multiple tipped solid shank tools such as: End mills, side mills, hollow mills, profiling cutters, form and grooving tools, step drills, reamers, core drills, spotfacers, counterbores, valve seating tools, broaches, saws.

The preparation of the steel shanks or other supporting parts of some of the tools are here explained and well illustrated. Also the preparation of the corresponding tips.

After that comes the description of the way the tip must be fastened to the supporting part of the tool, with the necessary sketches.

Then we have the grinding and lapping of the cutting edge with the necessary precautions to be taken to avoid cracks through faulty operation. Every step in the process is explained and clearly shown on diagrams and pictures. Photographs of a few special grinding machines are also given.

Methods for the economic use of cemented carbide tools are discussed, as mistakes in the proper handling, setting up, depth of cut, feed, speed, use of coolants, etc., may be costly. Photographs of the cutting process are shown.

The dulling of the edge must be observed in time, because otherwise there is danger of having the tip destroyed.

The proper set up is important. The tool overhang should be as small as possible, and the tool must be set to cut on the center line of the work. Only the proper size of tool for the job must be selected.

The machine should not stop while the tool is engaged, otherwise the tip may be easily destroyed.

Care should be used to avoid excessive depth of cut.

In general the speed can be in-

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creased greatly with cemented carbide tools, compared to high speed steel tools; in most cases at least 100 per cent.

Chucks, clamps and holding devices should hold the work solidly to prevent loosening during the machining operation.

Proper maintenance of tools by users is essential to the successful use of cemented carbides. Tools should be reground before they become dull to the point of failure. It is usually necessary to remove only a few thousandths from the tip to renew the cutting edge. Special silicon carbide stones are available for occasional stoning. Special diamond impregnated stones, or hones, as well as silicon carbide and diamond impregnated grinding wheels, are also available. The latter are especially satisfactory for the resharpening and maintenance of cemented carbide tools.

It is easily seen that the successful use of cemented carbide tools requires adequate supervision. It is also highly desirable to have on hand a sufficient variety of shapes and sizes of tool tips in order to be ready to use the proper tip for the proper job without unnecessary delay or danger of spoiling.

Another application of cemented carbides is found in dies. These materials are generally used for the drawing of bars, rods, wire, and tubing, and in a wide variety of sizes and shapes. Extrusion, sizing, deep drawing, forming, eyelet, and burnishing dies, as well as mandrels, are also widely used.

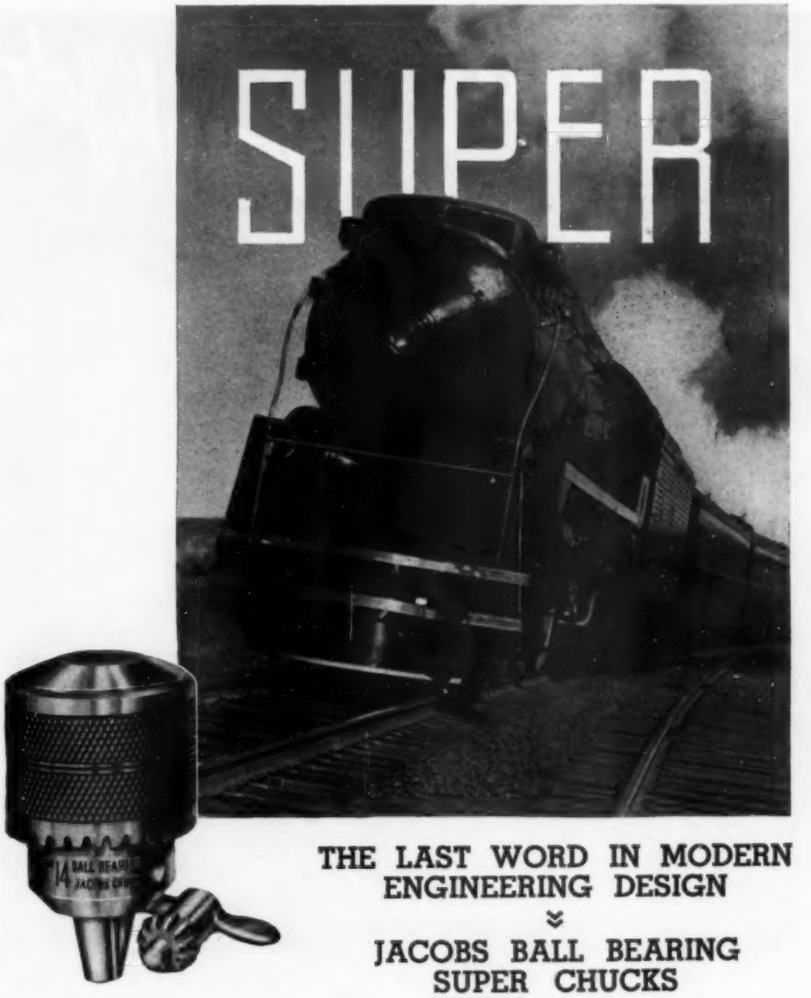
Cemented carbides are finally used where localized wear or corrosion is a problem. This includes small tools, as well as parts and accessories for production machines. They should not be considered however for such items as tank linings, gear teeth, or tractor treads.

Some practical examples and tables are given at the end of this useful booklet. S.J.K.

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION 1936. *446 pages, 6x9 inches. United States Government Printing Office, Washington, D. C. Price $1.50.*

To anyone who is interested in knowing what is being done in the various branches of science this volume will be of great interest and value. In addition to the necessary routine matters there are reports on the rocket experiments of Dr. R. H. Goddard, Dr. Mozley's mollusk investigations and Dr. Blackwelder's study of the fauna of the West Indies, while the appendix is filled with data on many subjects. Among these are astronomy in Shakespeare's time, size and age of the universe, sunspots, Northern Lights, new aspects of evolution, gorillas and vampire bats, birds of Ceylon, sun rays and plant life, aerial photography, Eskimo archeology of Iceland and the history of the cross bow. There are about 120 plates of illustrations and the type and paper used make the text easy to read. One does not have to be a scientist or a student to find entertainment, as well as a wealth of interesting information in this volume.

GRINDING PRACTICE. *By Fred H. Colvin, editor, American Machinist and Frank A. Stanley, editor, Western Machinery and Steel World. 310 pages, 6x9 in. Clothboard binding. Indexed and illustrated. Published by McGraw-Hill Book Company,*



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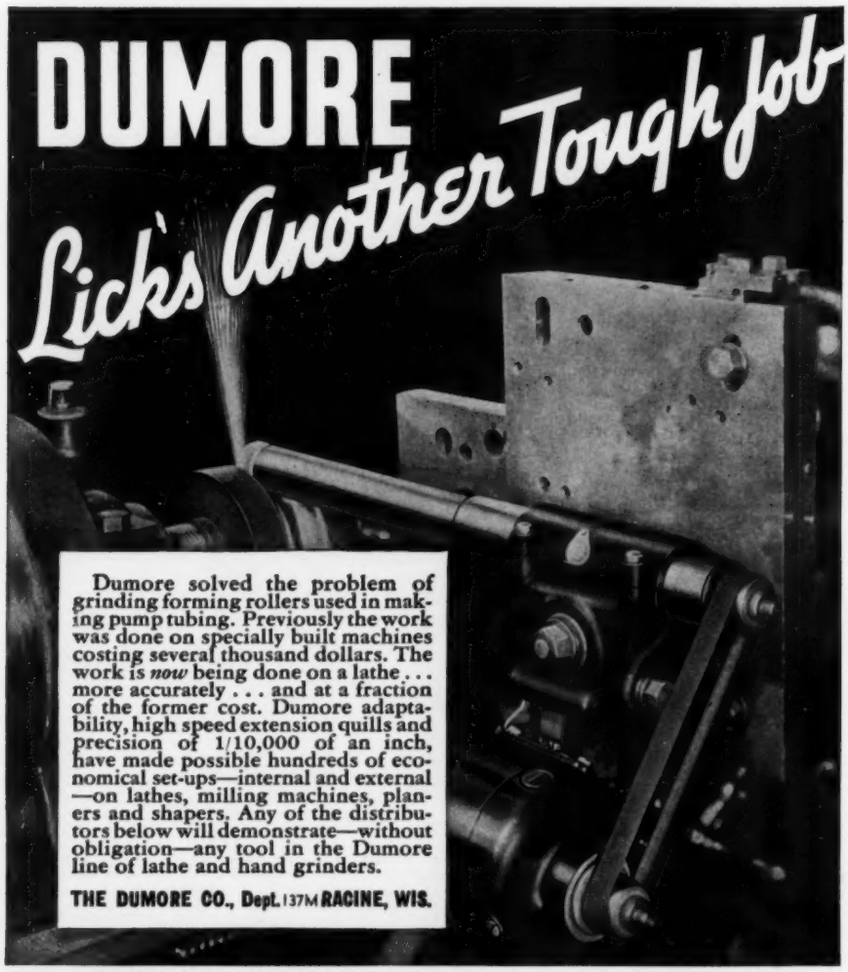
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TRADE PUBLICATIONS

CENTRI-CAST IRONS Bulletin No. 135, announced by Shenango-Penn Mold Co., Dover, Ohio, illustrates and describes various cast-iron products cast in centrifugal molds.

BENCH SHAPER Atlas Press Co., 1819 N. Pitcher St., Kalamazoo, Mich., offers a profusely illustrated mailing folder describing the 7-in. precision bench shaper recently announced.

BOLTS Simplified Practice Recommendation No. R169-37, covering machine, carriage and lag bolts, has received the required degree of acceptance by the industry and is being promulgated, effective from November 1, 1937, according to an announcement by the Division of Simplified Practice, National Bureau of Standards, Department of Commerce, Washington, D. C.

CENTRIFUGAL PUMPS A line of pressed-steel-frame mounted, ball-bearing centrifugal pumps is described in two bulletins issued by Worthington Pump and Machinery Corp., Harrison, N. J. These Type CF pumps are suitable for handling from 10 to 300 gal. per min.

COMPARATOR A 4-page bulletin published by Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y., describes the Sykes gear-tooth comparator and explains the principle of its operation.

DIESEL POWER Recent industrial applications of Diesel powered equipment are illustrated in a 12-page bulletin, Form No. 4386, published by Caterpillar Tractor Co. Peoria, Ill.

ELASTIC BEHAVIOR A new apparatus for the examination of elastic behavior of soft metals, such as tin and its alloys, under the necessarily small stresses which can be applied to them, was recently invented by J. W. Cuthbertson and is described in Technical Publication Series A, No. 60, offered by the International Tin Research and Development Council, 149 Broadway, New York, N. Y.

FLOW METERS Bulletin No. 494, announced by The Bristol Co., Waterbury, Conn., illustrates applications and outlines the special features of the electric flow meter.

FURNACES Model V high-temperature tube furnaces, manufactured

by The Sentry Co, Foxboro, Mass., are described in Bulletin No. 1016-1. These furnaces are available in one and two-tube types.

GAGES "Controlled Strip Thickness" is the title of a 16-page booklet describing the application of Electro-limit mill gages offered by Pratt & Whitney Div., Niles-Bement Pond Co., Hartford, Conn. The Electrolimit strain gage is also discussed.

HEATING SPECIALTIES Bulletin No. V260, announced by the Trane Co., LaCrosse, Wis., describes various valves, traps, strainers, gages and regulators available for use with heating systems. Seventeen of the thirty-four pages are devoted to data of value to the heating engineer.

HIGHWAY SAFETY Titled "We and Our Highways", a booklet being distributed by General Electric Co., Schenectady, N. Y., to its employees, gives a clear picture of today's traffic accident problem and the seven steps believed necessary to make highways safer.

LABOR A revealing picture of the contrast between the treatment of labor in the United States and in foreign countries is included in a 48-page booklet announced by Transportation Association of America, Inc., 400 West Madison St., Chicago, Ill. Bearing the title "Labor Under the Isms," this book reduces factual information to the simplest terms.

LITERATURE LIST "The Haynes Stellite Library", a booklet offered by Haynes Stellite Co., 205 E. 42nd St., New York, N. Y., lists and briefly describes 18 books, reprints and folders dealing with hard-facing alloys, cutting tools and alloys for chemical processing equipment.

MELTING POTS Electric pots for melting babbitt, solder, tin, type metal and lead, under continuous service conditions and with temperatures up to 1,000 F., are described in a four-page bulletin offered by Harold E. Trent Co., 618 N. 54th St., Philadelphia, Pa.

MOTOR TRUCKS The 1937 edition of Motor Truck Facts", recently released by the Automobile Manufacturers Association, Inc., 366 Madison Ave., New York, N. Y., contains much information of value to truck manufacturers and operators. Growth in motor truck use is manifested in the registration of 4,023,606 units during 1936—a new high.

NICKEL Bulletin No. T-13, offered by Development and Research Div., The International Nickel Co., Inc., 67 Wall St., New York, N. Y., discusses the use of nickel and nickel-base alloys in the design of corrosion-resistant machinery and equipment. Considerable factual information is given in this booklet.

OPTICAL PYROMETERS Catalog No. 90, announced by The Pyrometer Instrument Co., 103-105 Lafayette St., New York, N. Y., describes in detail the principles of the optical pyrometer and shows the features of several new models.

POWER The role of power in the upbuilding of America is reflected in a pamphlet "Facts about Power," issued by the Chamber of Commerce of the United States, Washington, D. C.

PRE-FAB HOUSES "Pre-Fab In Pictures", an 18-page bulletin announced by Houses Div., Harnischfeger Corp., 6785 W. Greenfield Ave., Milwaukee, Wis., describes the fabrication of standard steel sections for pre-fabricated houses and

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RAILROAD DATA The 1937 edition of "A Year Book of Railroad Information," published by the Committee on Public Relations of the Eastern Railroads, 143 Liberty St., New York, N. Y., is now available. This 96-page booklet provides a ready reference for authoritative facts relating to the railroad industry.

SALES "How to Increase Your Sales" is the title of an effective 92-page book recently published by the Porcelain Enamel Institute, 612 N. Michigan Ave., Chicago, Ill. Written by William Sibley, this book gives considerable information that should be of value to any salesman.

SALES MANUAL The Dumore Co., Racine, Wis., has announced publication of a new industrial sales manual, which is being sent to the industrial supply distributors.

SALT BATHS Liquid salt baths for the heat-treatment of steel are discussed in a 16-page booklet announced by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia.

STEAM "Steam Hook-Ups" is the title of a 30-page booklet announced by Sarco Co., Inc., 183 Madison Ave., New York, N. Y. Methods for calculating steam trap sizes, descriptions of various types of heating systems and basic descriptions of the fundamental characteristics of various accessories are given.

STEEL PRODUCTS Definitions of the primary group of semi-finished steel products are an important feature of a pamphlet issued by the American Iron and Steel Institute, 350 Fifth Ave., New York, N. Y. This pamphlet comprises Section 2 of a projected "Steel Products Manual." Section 1, published in September, related to pig iron and ferro-alloys. Single copies are available at a price of 15 cents each.

TIMKEN BEARINGS A 52-page supplement to the Timken Engineering Journal, describing the application of roller bearings to oil-field equipment, has been announced by The Timken Roller Bearing Co., Canton, Ohio.

TUBE COUPLINGS Bulletin No. 500, announced by Packless Metal Products Corp., Long Island City, N. Y., describes self-flaring tube couplings and includes tabulated data of interest to the designer.

VERTICAL BORING MILLS Bulletin No. 106, announced by Consolidated Machine Tool Corp., Rochester, N. Y., discusses the features of Colburn heavy-duty 72-84 in. swing, vertical boring and turning mills, which are available with or without side heads.

VISES Catalog No. 38-A, offered by Athol Machine & Foundry Co., Athol, Mass., lists and describes the features of a number of standard and special purpose vises.

WEAR OF METALS "Symposium on Wear of Metals", comprising six technical papers presented at a meeting of the American Society for Testing Materials in Philadelphia in April, covers such subjects as: considerations involved in the wear-testing of metals, wear-testing of cast iron, and the wear of metals from the automotive viewpoint. Another paper covers wear from the power equipment viewpoint, and another discusses wear of metals from the railroad viewpoint. This 105-page bulletin can be obtained from the Society's headquarters, 260 S. Broad St., Philadelphia, Pa., at $1.25 each.

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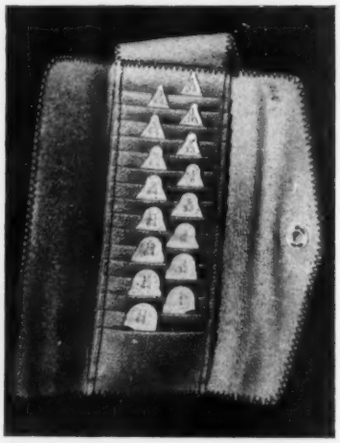

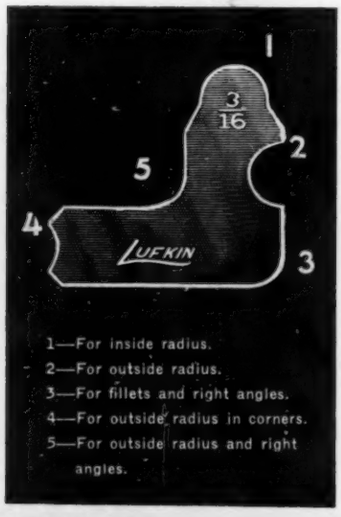

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